

# ***The BOCA Basic Building Code / 1978***

Model building regulations for the protection  
of public health, safety and welfare.

**SEVENTH EDITION**

As recommended and maintained  
by the active membership of



**BUILDING OFFICIALS & CODE ADMINISTRATORS  
INTERNATIONAL, INC.**

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## PREFACE

The *Basic Building Code*, now in its 28th year, states regulations in terms of measured performance rather than in rigid specification of materials and, in this way, makes possible the acceptance of new materials and methods of construction which can be evaluated by accepted standards, without the necessity of adopting cumbersome amendments for each variable condition.

By presenting the purposes to be accomplished rather than the method to be followed, the *Basic Building Code* allows the designer the widest possible freedom and does not hamper development. It accepts nationally recognized standards as the criteria for evaluation of minimum safe practice, or for determining the performance of materials or systems of construction. The application of these standards is stated in the text of the code requirements, and the standards are listed and identified in the appendices of the code, making it practical and convenient to update any standard as it is revised or reissued by the sponsoring agency.

This seventh edition presents the code as originally issued, with changes approved through 1977, and with certain editorial changes made to maintain the sequence of the code, to standardize the format of all 1978 *Basic Codes*, and to update the reference to standards.

This code, as are the other codes published by Building Officials and Code Administrators International, is kept up to date through the review of changes proposed by code enforcement officials, industry and design professionals, and other interested persons and organizations. Proposed changes are discussed in a public hearing, carefully reviewed by committees, and acted upon by code enforcement officials in an open meeting of the organization. Those changes approved are published annually in supplements to the code, in convenient form for adoption by local governments. A new edition such as this is then prepared every three years, and contains all approved changes since the previous edition.

Changes as described above do not just happen. This *Basic Building Code* is dedicated to the hundreds of code enforcement officials from

throughout the United States and Canada; to the engineers, architects, technicians, builders, contractors, material producers, trade associations and others who voluntarily collaborated in its preparation; and to the members of the code changes committees and their subcommittees, who participated in the important work of keeping the code abreast of new developments in construction technology. These men have given unstintingly of their time and their talents to produce and maintain this performance-type code, which, in its relatively short history, has been widely recognized, highly respected, and adopted by countless communities.

This edition of the *Basic Building Code* includes a new article setting forth energy conservation requirements for building construction (see Article 20, "Energy Conservation") which deal specifically with exterior building envelope requirements. Energy conservation provisions are also contained in Article 15 for electrical requirements. All energy conservation provisions in the BOCA *Basic Code* series are based upon requirements of the ASHRAE Standard 90-75.

BOCA energy conservation provisions are to be found in the *Basic Plumbing* and *Basic Mechanical Codes* as well as in the *Basic Building Code*. The *Basic Code* provisions for energy conservation are also separately compiled in a single document entitled the BOCA *Basic Energy Conservation Code*.

Use of the *Basic Building Code* or any of the other BOCA *Basic Codes* within a government jurisdiction may be accomplished only through *adoption by reference* in a proceeding of the jurisdiction's board, council, or other authoritative governing body. At the time of adoption, jurisdictions should insert the appropriate information in those passages of a code requiring specific local information, such as the date of adoption, name of adopting jurisdiction, dollar amount of fines and permit costs, etc. These passages are shown in bracketed italics in the codes, and are also listed on the Adoption Information page of each code for which the local adoption information is required. In addition, jurisdictions may amend or modify *Basic Code* provisions to accomplish desired local requirements, although use of the codes in substantially original and standardized form is encouraged by the BOCA organization. Sample drafts of adopting ordinances for each of the BOCA *Basic Codes* are available free of charge upon request to BOCA International.

## ADOPTION INFORMATION

Communities wishing to adopt the BOCA *Basic Building Code/1978* as an enforceable building regulation in their jurisdiction should make sure that certain factual information is included in the code text and adopting ordinance at the time adoption is being considered by the appropriate governmental body. The required information, which indicates applicability of the code to a particular jurisdiction, can be itemized as follows:

1. The *name of the jurisdiction* should be inserted in the second line of *Section 100.1* on Page 1 of the code.
2. The *name of the jurisdiction* should be inserted in the fifth line of *Section 100.2* on Page 1 of the code.
3. The *date of adoption of this code* should be inserted in the second line of *Section 105.1* on Page 3 of the code.
4. The *name of the jurisdiction* should be inserted in the second line of *Section 107.1* on Page 4 of the code.
5. The *appropriate fee schedule* should be inserted under the second line of *Section 117.3.1* on page 13 of the code.
6. The *dollar amount* should be inserted in the third line of *Section 117.4* on Page 13 of the code.
7. The *dollar amount* should be inserted in two places in the second line of *Section 117.5* on Page 13 of the code.
8. The *dollar amount* should be inserted in the sixth line of *Section 121.4* on Page 16 of the code.
9. The *specific offense* should be inserted in the sixth line of *Section 121.4* on Page 16 of the code, and the *maximum imprisonment penalty* should be inserted in the seventh line of that section.
10. The *dollar amount* should be inserted in the fourth and fifth lines of *Section 122.2* on Page 17 of the code.
11. The *dollar amount* should be inserted in the second line of *Section 125.3* on Page 19 of the code.
12. The *name of the jurisdiction* should be inserted in the third line of *Section 200.1* on Page 25 of the code.
13. The *name of the jurisdiction* should be inserted in the third line of *Section 200.3* on Page 25 of the code.
14. The *name of the jurisdiction* should be inserted in the second line of *Section 300.1* on Page 83 of the code.
15. The *boundaries of the fire limits* should be inserted in the fourth line of *Section 301.2* on Page 83 of the code.
16. The *number of feet* should be inserted in the second line of *Section 1307.2.1* on Page 367 of the code.
17. The *number of feet* should be inserted in the second line of *Section 1307.2.2* on Page 368 of the code.
18. The *dollar amount* should be inserted in the fourth, fifth and sixth lines of *Section 1406.1* on Page 378 of the code.
19. The *name of the jurisdiction* should be inserted in the second line of *Section 1406.2* on Page 378 of the code.
20. The *name of the jurisdiction* should be inserted in the fourth line of *Section 1702.1* on Page 410 of the code.
21. The *name of the jurisdiction* should be inserted in the third line of *Section 1800.5* on Page 416 of the code.

### **Note to Basic Code users**

Effective with publication of the 1978 Editions, the BOCA *Basic Codes* contain a new format change for the benefit and convenience of code users. Vertical lines have been added in the margins adjacent to all passages of code text which have changed since a code's previous edition. For example, lines shown in the margins of the 1978 *Basic Codes* indicate content change since the 1975 Editions. This feature is designed to streamline the review process for jurisdictions wishing to adopt current, up-to-date code provisions.

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## EDITORIAL CHANGES—SECOND PRINTING

- pg. 80 and 81, Table 214: lines and arrows inadvertently omitted from Table 214 have now been added.
- pg. 80, Table 214: item number "5" in first column now reads . . . Shafts (*other than exitways*), elevator hoistways (Section 910.0)
- pg. 81, Table 214: Note b now reads . . . The fire separation or fire exposure in feet as herein limited applies to the distance *measured from the building face to the closest interior lot line, the center line of a street or public space or an imaginary line between two (2) buildings on the same property.*
- pg. 84, Table 302: Note 1 and Note 2 of Table 302 have been combined into one (1) note, *Note 1.*
- pg. 88, Table 305: "X" marks indicating unlimited height and area of buildings, inadvertently omitted from Table 305, have now been added.
- pg. 124, Section 414.3: the fraction "one-tenth" in line four now reads *one one-hundredth.*
- pg. 156, Section 432.2.12: last line of section now reads . . . structures *within* the covered mall shall be twenty (20) feet.
- pg. 159, Section 505.3: lead line of section now reads . . . Uncovered *yard* and court area;
- pg. 167, Section 520.1: third line of section now reads . . . with the provisions of Section 1619.0 and not accepted as a required ele-
- pg. 168, Section 520.5: last line of section now reads . . . controlled fire shutter conforming to the *provisions* of Section 1619.3.
- pg. 211, Table 714.2.1: third item under column heading "35° to 45°" now reads . . . -0.1
- pg. 268, Section 854.4: nominal thickness listing for "Aluminum clapboard siding" now reads . . . 0.024 inch
- pg. 290, Section 876.5: last sentence of section reading "*The products of combustion shall not be more toxic than those of untreated wood burned under similar conditions.*" has been deleted.
- pg. 312, Section 917.1: section now reads . . . *One-quarter (¼) inch wired glass, which has been listed and labeled for use in approved labeled opening protectives, may be used with the size limitations described in Table 917.* In addition, a vertical line has been added in the margin next to this section to indicate a change from previous editions.
- pg. 316, Section 920.7: vertical line added to margin next to section to indicate change from previous editions of the *Basic Building Code.*
- pg. 358, Section 1216.3.3: last line of section now reads . . . section shall comply with the standard listed in *Appendix I.*
- pg. 408, Section 1619.2.1: fourth line of section now reads . . . operated shutter conforming to Section 1619.3; except that the machine
- pg. 436, Table 2002.2.2: figure title now reads . . . MAXIMUM ALLOWABLE "Uo" VALUES FOR ROOF/CEILING ASSEMBLIES
- pg. 437, Figure 2002.2.4: figure title now reads . . . MINIMUM ALLOWABLE R VALUES FOR PERIMETER INSULATION FOR SLAB-ON-GRADE FLOORS
- pg. 473, Appendix I: reference standard number for "Hardware, Swinging, for Standard Tin-Clad Fire Doors" under heading "Prevention of Spread of Fire" now reads . . . UL 14C-73

## EDITORIAL CHANGES—THIRD PRINTING

- pg. 2, Section 103.1: a comma has been added after the word "plumbing" in the third line.
- pg. 4, Section 106.7: fourth line of section now reads . . . fire *separation assemblies* complying with the fire grading in Table 902,
- pg. 30, Section 201.0, definitions: last line in definition of "Central station system" now reads . . . *protected* properties.
- pg. 36, Section 201.0, definitions: second and third lines in definition of "Fire separation, exterior fire exposure" now read . . . from the building face to the closest interior lot line, to the center line of a street or public space, or to an imaginary line between two buildings on the same property.
- pg. 39, Section 201.0, definitions: second and third lines in definition of "Light-diffusing system" now read . . . or in part of lenses, panels, grids or baffles suspended below *independently-mounted electrical lighting sources.*

- pg. 41, Section 201.0, definitions: a comma has been added after the word "lobbies" in the last line of the definition of "means of egress."
- pg. 43, Section 201.0, definitions: definition of "Plastic glazing" has been changed to read . . . *Plastic materials which are glazed or set in frame or sash and not held by mechanical fasteners which pass through the glazing material.* Definition of "Plastic roof panels" now reads . . . *Plastic materials which are fastened to structural members, or to structural panels or sheathing, and which are used as light-transmitting media in roofs.*
- pg. 44, Section 201.0, definitions: first line in definition of "Plastic wall panel" has been changed to read . . . *Plastic wall panels: Plastic materials which are fastened to structural*
- pg. 45, Section 201.0, definitions: definition of "Reinforced thermosetting plastic" has been changed to read . . . *Reinforced plastic, glass fiber: Plastic reinforced with glass fiber having not less than twenty per cent (20%) of glass fibers by weight.*
- pg. 49, Section 201.0, definitions: definition of "thermosetting material" has been changed to read . . . *A plastic material which is capable of being changed into a substantially non-reformable product when cured.* Definition of "Thermoplastic material" has been changed to read . . . *A plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.*
- pg. 112, Sections 407.5.1 and 407.6.2: reference to NFIP Standard 42, Pyroxylin Plastics, in ninth line of Section 407.5.1 and second line of Section 407.6.2 has been changed to read . . . *NFIP 40E*
- pg. 113, Section 408.2.5: third and fourth lines of section now read . . . *air heating and air conditioning systems shall comply with the mechanical code listed in Appendix B and shall be protected with automatic fire*
- pg. 118, Section 410.1: last line of section now reads . . . *deemed to conform to the requirements of this code.*
- pg. 136, Section 419.5: sixth line of section now reads . . . *complying with Article 12 and the standards listed in Appendix I for*
- pg. 155, Section 432.2.9: eighth line of section now reads . . . *with the applicable standards listed in Appendix I, by operation of the*
- pg. 161, Section 512.1: last line of section now references Section 512.7.
- pg. 178, Section 610.4.1: last two lines of section now read . . . *ASTM E152 listed in Appendix G without the hose stream and labeled and listed by an independent, approved agency.*
- pg. 188, Section 616.9.2: second line in third exception item to section now references Section 616.10.
- pg. 194, Section 620.1: sixth line of section now references Section 1619.0.
- pp. 202-203, Table 706: Entry on line nineteen under heading "Live load (psf)" has been deleted. Note 1 to table now reads . . . *American Association of State Highway Transportation Officials.* Last line of Note 2 now reads . . . *uted over the entire span.*
- pg. 219, Section 726.1: last line of section now reads . . . *Design Specification for Wood Construction listed in Appendix B.*
- pg. 232, Section 802.2.1: fourth line of section now references Section 857.5.4.
- pg. 253, Section 829.1: last line of section now references Appendix C.
- pg. 298, Section 905.1: last line of section now references Section 905.9.
- pg. 300-301, Section 905.10: exception to section contains new text similar to that of Section M-300.6 of the BOCA *Basic Mechanical Code/1978.*
- pg. 305, Section 909.3.1: last line of section now reads . . . *firestopped to comply with Sections 875.9 and 919.0.*
- pg. 343, Section 1202.17: second line of section now references Sections 520.0 and 616.10.
- pg. 351-352, Sections 1210.6 and 1211.2.3: items 6 and 7 of Section 1210.6 have been changed to correspond to those found in Section M-1011.6 of the BOCA *Basic Mechanical Code/1978.* First line of Section 1211.2.3 now reads . . . *In buildings four (4) stories or more in height.*
- pg. 357, Section 1216.3: last line of section now reads . . . *scribed in the following Sections 1216.3.1 through 1216.3.3.*
- pg. 359, Section 1217.3.1: second line of exception to section now references Section 1216.3.3.
- pg. 365, Section 1305.2: last line of section now references Section 1705.4.
- pg. 398, Section 1609.1.2: seventh line of section now reads . . . *hundred (100) pounds per square foot (psf) the enclosure and opening pro-*
- pg. 424, Section 1900.2.1, definitions: first definition of "Plastic roof panels" is now shown under "Plastic glazing." Third line in definition of "Plastic roof panels," which follows "Plastic glazing," now reads . . . *light-transmitting media in roofs.*

# ARTICLE 1

## ADMINISTRATION AND ENFORCEMENT

### SECTION 100.0 SCOPE

**100.1 Title:** These regulations shall be known as the Building Code of [*name of jurisdiction*] hereinafter referred to as "this code."

**100.2 Scope:** These regulations shall control all matters concerning the construction, alteration, addition, repair, removal, demolition, use, location, occupancy and maintenance of all buildings and structures, and shall apply to existing or proposed buildings and structures in the [*name of jurisdiction*]; except as such matters are otherwise provided for in other ordinances or statutes, or in the rules and regulations authorized for promulgation under the provisions of this code.

**100.3 Application of references:** Unless otherwise specifically provided in this code, all references to article or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such article, section or provision of this code.

**100.4 Code remedial:** This code shall be construed to secure its expressed intent, which is to insure public safety, health and welfare insofar as they are affected by building construction, through structural strength, adequate egress facilities, sanitary equipment, light and ventilation and fire safety; and, in general, to secure safety to life and property from all hazards incident to the design, erection, repair, removal, demolition or use and occupancy of buildings, structures or premises.

### SECTION 101.0 APPLICABILITY

**101.1 General:** The provisions of these regulations shall cover all matters affecting or relating to buildings and structures, as set forth in Section 100.0.

**101.2 Exemptions:** A building or structure shall not be constructed, extended, repaired, removed or altered in violation of these provisions, except for ordinary repairs as defined in Section 102.0, and except further that the raising, lowering or moving of a building or structure as a unit

necessitated by a change in legal grade or widening of a street shall be permitted, provided the building or structure is not otherwise altered or its use or occupancy changed.

**101.3 Matters not provided for:** Any requirement essential for structural, fire or sanitary safety of an existing or proposed building or structure, or essential for the safety of the occupants thereof, and which is not specifically covered by this code, shall be determined by the building official.

**101.4 Continuation of unlawful use:** The continuation of occupancy or use of a building or structure, or of a part thereof, contrary to the provisions of this code, shall be deemed a violation and subject to the penalties prescribed in Section 122.0.

**101.5 Other regulations:** When the provisions herein specified for health, safety and welfare are more restrictive than other regulations, this code shall control; but in any case, the most rigid requirements of either the building code or other regulations shall apply whenever they may be in conflict.

## **SECTION 102.0 ORDINARY REPAIRS**

**102.1 General:** Ordinary repairs to structures may be made without application or notice to the building official; but such repairs shall not include the cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or bearing support, or the removal or change of any required means of egress, or rearrangement of parts of a structure affecting the exitway requirements; nor shall ordinary repairs include addition to, alteration of, replacement or relocation of any standpipe, water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring or mechanical or other work affecting public health or general safety.

## **SECTION 103.0 INSTALLATION OF SERVICE EQUIPMENT**

**103.1 General:** When the installation, extension, alteration or repair of an elevator, moving stairway, mechanical equipment, refrigeration, air conditioning or ventilating apparatus, plumbing, gas piping, electric wiring, heating system or any other equipment is specifically controlled by the provisions of this code or the approved rules, it shall be unlawful to use such equipment until a certificate of approval has been issued therefor by the building official or other agency having jurisdiction.

## **SECTION 104.0 MAINTENANCE**

**104.1 General:** All buildings and structures and all parts thereof, both existing and new, shall be maintained in a safe and sanitary condition.

All service equipment, means of egress, devices and safeguards which are required by this code in a building or structure, or which were required by a previous statute in a building or structure, when erected, altered or repaired, shall be maintained in good working order.

**104.2 Owner responsibility:** The owner or his designated agent shall be responsible for the safe and sanitary maintenance of the building or structure and its exitway facilities at all times.

### SECTION 105.0 CHANGE IN EXISTING USE

**105.1 Continuation of existing use:** The legal use and occupancy of any structure existing on [*date of adoption of this code*] or for which it had been heretofore approved, may be continued without change, except as may be specifically covered in this code and the housing code or as may be deemed necessary by the building official for the general safety and welfare of the occupants and the public.

**105.2 Change in use:** It shall be unlawful to make any change in the use or occupancy of any structure which would subject it to any special provision of this code without approval of the building official, and his certification that such structure meets the intent of the provisions of law governing building construction for the proposed new use and occupancy, and that such change does not result in any greater hazard to public safety or welfare.

### SECTION 106.0 EXISTING STRUCTURES

**106.1 Application:** Except as provided in this section, existing structures, when altered or repaired as herein specified, shall be made to conform to the full requirements of this code for new structures.

**106.2 Alterations exceeding 50 per cent:** If alterations or repairs are made within any period of twelve (12) months, costing in excess of fifty (50) per cent of the physical value of the structure, this code's requirements for new structures shall apply.

**106.3 Damages exceeding 50 per cent:** If the structure is damaged by fire or any other cause to an extent in excess of fifty (50) per cent of the physical value of the structure before the damage was incurred, this code's requirements for new structures shall apply.

**106.4 Alterations under 50 per cent:** If the cost of alterations or repairs described herein is between twenty-five (25) and fifty (50) per cent of the physical value of the structure, the building official shall determine to what degree the portions so altered or repaired shall be made to conform to the requirements for new structures.

**106.5 Alterations under 25 per cent:** If the cost of alterations or repairs

described herein is twenty-five (25) per cent or less of the physical value of the structure, the building official shall permit the restoration of the structure to its condition previous to damage or deterioration with the same kind of materials as those of which the structure was constructed; provided that such construction does not endanger the general safety and public welfare and complies with the provisions of Section 926.2 in respect to existing roofs.

**106.6 Increase in size:** If the structure is increased in floor area or number of stories, the entire structure shall be made to conform with the requirements of this code in respect to means of egress, fire safety, light and ventilation.

**106.7 Part change in use:** If a portion of the structure is changed in occupancy or to a new use group, and that portion is separated from the remainder of the structure with the required vertical and horizontal fire separation assemblies complying with the fire grading in Table 902, then the construction involved in the change shall be made to conform to the requirements for the new use and occupancy, and the existing portion shall be made to comply with the exitway requirements of this code.

**106.8 Physical value:** In applying the provisions of this section, the physical value of the structure shall be determined by the building official and be based on current replacement costs.

## SECTION 107.0 DEPARTMENT OF BUILDING INSPECTION

**107.1 Building official:** The department of building inspection of [*name of jurisdiction*] is hereby created and the executive official in charge thereof shall be known as the building official.

**107.2 Appointment:** The building official shall be appointed by the chief appointing authority of the jurisdiction; and he shall not be removed from office except for cause and after full opportunity has been granted him to be heard on specific and relevant charges by and before the appointing authority.

**107.3 Organization:** The building official shall appoint such number of officers, technical assistants, inspectors and other employees as shall be necessary for the administration of this code and as authorized by the appointing authority.

**107.4 Deputy:** The building official may designate an employee as his deputy who shall exercise all the powers of the building official during the temporary absence or disability of the building official.

**107.5 Qualifications of building official:** To be eligible for appointment, the building official shall have had at least five (5) years building experience as a licensed professional engineer or architect, building inspector, contractor or superintendent of building construction. For three (3) years of which experience he shall have been in responsible charge of

work; and he shall be generally informed on good engineering practice in respect to the design and construction of buildings, the basic principles of fire prevention, the accepted requirements for means of egress and the installation of elevators and other service equipment necessary for the health, safety and general welfare of the occupants.

**107.6 Qualifications of assistants:** A person shall not be appointed as a technical assistant unless he has had at least three (3) years practical experience in the technical work which he is appointed to supervise, or in responsible charge of building construction, or as a skilled worker. A person shall not be appointed as inspector of construction who has had less than three (3) years experience in general building construction.

**107.7 Restriction of employees:** An official or employee connected with the department of building inspection, except one whose only connection is that of a member of the board of survey or of the board of appeals established under the provisions of Sections 125.0 and 126.0, shall not be engaged in or directly or indirectly connected with the furnishing of labor, materials or appliances for the construction, alteration or maintenance of a building, or the preparation of plans or of specifications therefor, unless he is the owner of the building; nor shall such officer or employee engage in any work which conflicts with his official duties or with the interests of the department.

**107.8 Relief from personal responsibility:** The building official, officer or employee charged with the enforcement of this code, while acting for the jurisdiction, shall not thereby render himself liable personally, and he is hereby relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or permitted in the discharge of his official duties. Any suit instituted against any officer or employee because of an act performed by him in the lawful discharge of his duties and under the provisions of this code shall be defended by the legal representative of the jurisdiction until the final termination of the proceedings. The building official or any of his subordinates shall not be liable for costs in any action, suit or proceeding that may be instituted in pursuance of the provisions of this code; and any officer of the department of building inspection, acting in good faith and without malice, shall be free from liability for acts performed under any of its provisions or by reason of any act or omission in the performance of his official duties in connection therewith.

**107.9 Official records:** An official record shall be kept of all business and activities of the department specified in the provisions of this code, and all such records shall be open to public inspection at all appropriate times.

## **SECTION 108.0 DUTIES AND POWERS OF BUILDING OFFICIAL**

**108.1 General:** The building official shall enforce all the provisions of



this code and shall act on any question relative to the mode or manner of construction and the materials to be used in the erection, addition to, alteration, repair, removal, demolition, installation of service equipment, and the location, use, occupancy, and maintenance of all buildings and structures, except as may otherwise be specifically provided for by statutory requirements or as provided in the following Sections 108.2 through 108.8.

**108.2 Applications and permits:** He shall receive applications and issue permits for the erection and alteration of buildings and structures, and inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.

**108.3 Building notices and orders:** He shall issue all necessary notices or orders to remove illegal or unsafe conditions, to require the necessary safeguards during construction, to require adequate exitway facilities in existing buildings and structures, and to insure compliance with all the code requirements for the safety, health and general welfare of the public.

**108.4 Inspections:** He shall make all the required inspections, or he may accept reports of inspection by authoritative and recognized services or individuals; and all reports of such inspections shall be in writing and certified by a responsible officer of such authoritative service or by the responsible individual; or he may engage such expert opinion as he may deem necessary to report upon unusual technical issues that may arise, subject to the approval of the appointing authority.

**108.5 Credentials:** The building official or his authorized representative shall carry proper credentials of his respective office for the purpose of inspecting any and all buildings and premises in the performance of his duties under this code.

**108.6 Rule making authority:** The building official shall have power as may be necessary in the interest of public safety, health and general welfare, to adopt and promulgate rules and regulations to interpret and implement the provisions of this code to secure the intent thereof and to designate requirements applicable because of local climatic or other conditions; but such rules shall not have the effect of waiving working stresses or fireresistive requirements specifically provided in this code or violating accepted engineering practice involving public safety.

**108.6.1 Accepted engineering practice:** In the absence of provisions not specifically contained in this code or approved rules, the regulations, specifications and standards listed in Appendix B, Accepted Engineering Practice, and Appendix C, Accredited Material Standards, shall be deemed to represent accepted engineering practice in respect to the material, equipment, system or method of construction therein specified.

**108.7 Department records:** The building official shall keep official rec-



ords of applications received, permits and certificates issued, fees collected, reports of inspections, and notices and orders issued. Such records shall be retained in the official records so long as the building or structure to which they relate remains in existence unless otherwise provided by other regulations.

**108.8 Annual report:** At least annually, the building official shall submit to the chief authority of the jurisdiction a written statement of operations in the form and content as shall be prescribed by such authority.

## SECTION 109.0 APPROVAL

**109.1 Approved materials and equipment:** All materials, equipment and devices approved for use by the building official shall be constructed and installed in accordance with such approval.

**109.2 Modifications:** When there are practical difficulties involved in carrying out structural or mechanical provisions of this code or of an approved rule, the building official may vary or modify such provision upon application of the owner or his representative, provided that the spirit and intent of the law shall be observed and public welfare and safety be assured.

**109.2.1 Records:** The application for modification and the final decision of the building official shall be in writing and shall be officially recorded with the application for the permit in the permanent records of the department of building inspection.

**109.3 Used materials and equipment:** Used materials, equipment and devices may be used provided they have been reconditioned, tested and placed in good and proper working condition and approved for use by the building official.

**109.4 Alternate materials and equipment:** The provisions of this code are not intended to prevent the use of any material or method of construction not specifically prescribed by this code, provided any such alternate has been approved. The building official may approve any such alternate provided he finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fireresistance, durability and safety.

**109.4.1 Research and investigations:** The building official shall require that sufficient technical data be submitted to substantiate the proposed use of any material or assembly, and if it is determined that the evidence submitted is satisfactory proof of performance for the use intended, he may approve its use subject to the requirements of this code.

The costs of all tests, reports and investigations required under these provisions shall be paid by the applicant.

**109.4.2 Research reports:** The building official may accept as supporting data to assist him in his determination duly authenticated Research Reports from the Building Officials and Code Administrators International or from other approved authoritative sources for all materials or assemblies proposed for use which are not specifically provided for in this code.

## SECTION 110.0 INSPECTION

**110.1 Preliminary inspection:** Before issuing a permit, the building official may examine or cause to be examined all buildings, structures and sites for which an application has been filed for a permit to construct, enlarge, alter, repair, remove, demolish or change the use thereof.

**110.2 Required inspections:** After issuing a building permit the building official shall conduct such inspections from time to time during and upon completion of the work for which he has issued a permit; and he shall maintain a record of all such examinations and inspections and of all violations of this code.

**110.2.1 Accredited inspection services:** The building official may accept reports of approved inspection services which satisfy his requirements as to qualifications and reliability.

**110.2.2 Plant inspection:** When required by the provisions of this code or by the approved rules, materials or assemblies shall be inspected at the point of manufacture or fabrication in accordance with Section 110.2.3 and Article 18.

**110.2.3 Inspection reports:** All inspection reports shall be in writing and shall be certified by the licensed authority, or responsible officer of the service, or the individual when expert inspection services are accepted. An identifying label or stamp permanently fixed to the product indicating that factory inspection has been made shall be accepted in lieu of the aforesaid inspection report in writing if the intent or meaning of such identifying label or stamp is properly substantiated.

**110.3 Final inspection:** Upon completion of the building or structure, and before issuance of the certificate of use and occupancy required in Section 119.0, a final inspection shall be made. All violations of the approved plans and permit shall be noted and the holder of the permit shall be notified of the discrepancies.

**110.4 Right of entry:** In the discharge of his duties, the building official or his authorized representative shall have the authority to enter at any reasonable hour any building, structure or premises in the jurisdiction to enforce the provisions of this code.

**110.5 Jurisdictional cooperation:** The assistance and cooperation of police, fire, and health departments and all other officials shall be available to him as required in the performance of his duties (see Section 403.0).

#### SECTION 111.0 RIGHT OF ENTRY

**111.1 General:** In the discharge of his duties, the building official or his authorized representative shall have the authority to enter at any reasonable hour any building, structure or premises in the jurisdiction to enforce the provisions of this code.

**111.2 Official badge:** He may adopt a badge of office for himself and assistants which shall be displayed for the purpose of identification.

**111.3 Jurisdictional cooperation:** The assistance and cooperation of police, fire, and health departments and all other officials shall be available to him as required in the performance of his duties (see Section 403.0).

#### SECTION 112.0 APPLICATION FOR PERMIT

**112.1 When permit is required:** It shall be unlawful to construct, enlarge, alter or demolish a structure; or change the occupancy of a building or structure requiring greater strength, exitway or sanitary provisions; or to change to another use; or to install or alter any equipment for which provision is made or the installation of which is regulated by this code, without first filing an application with the building official in writing and obtaining the required permit therefor; except that ordinary repairs, as defined in Section 102.0, which do not involve any violation of this code shall be exempt from this provision.

**112.2 Form of application:** The application for a permit shall be submitted in such form as the building official may prescribe and shall be accompanied by the required fee as prescribed in Section 117.0.

**112.3 By whom application is made:** Application for a permit shall be made by the owner or lessee of the building or structure, or agent of either, or by the licensed engineer or architect employed in connection with the proposed work. If the application is made by a person other than the owner in fee, it shall be accompanied by a duly verified affidavit of the owner or the qualified person making the application that the proposed work is authorized by the owner in fee and that the applicant is authorized to make such application. The full names and addresses of the owner, lessee, applicant, and of the responsible officers, if the owner or lessee is a corporate body, shall be stated in the application.

**112.4 Description of work:** The application shall contain a general description of the proposed work, its location, the use and occupancy of all parts of the building or structure and of all portions of the site or lot

not covered by the building or structure, and such additional information as may be required by the building official.

**112.5 Plans and specifications:** The application for the permit shall be accompanied by not less than two (2) copies of specifications and of plans drawn to scale, with sufficient clarity and detail dimensions to show the nature and character of the work to be performed. When quality of materials is essential for conformity to this code, specific information shall be given to establish such quality; and this code shall not be cited, or the term "legal" or its equivalent be used, as a substitute for specific information. The building official may waive the requirement for filing plans when the work involved is of a minor nature.

**112.6 Site plan:** There shall also be a site plan showing to scale the size and location of all the new construction and all existing structures on the site, distances from lot lines, the established street grades and the proposed finished grades; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the plot plan shall show all construction to be demolished and the location and size of all existing structures and construction that are to remain on the site or plot.

**112.7 Engineering details:** The building official may require adequate details of structural, mechanical and electrical work including computations, stress diagrams and other essential technical data to be filed. All engineering plans and computations shall bear the signature of the engineer or architect responsible for the design. Plans for buildings more than two (2) stories in height shall indicate how required structural and fire-resistance rating integrity will be maintained, and where a penetration will be made for electrical, mechanical, plumbing and communication conduits, pipes and systems.

**112.8 Amendments to application:** Subject to the limitations of Section 112.9, amendments to a plan, application or other records accompanying the same may be filed at any time before completion of the work for which the permit is sought or issued; and such amendments shall be deemed part of the original application and shall be filed therewith.

**112.9 Time limitation of application:** An application for a permit for any proposed work shall be deemed to have been abandoned six (6) months after date of filing, unless such application has been diligently prosecuted or a permit shall have been issued; except that for reasonable cause, the building official may grant one (1) or more extensions of time for additional periods not exceeding ninety (90) days each.

## SECTION 113.0 PERMITS

**113.1 Action on application:** The building official shall examine or cause to be examined all applications for permits and amendments thereto within a reasonable time after filing. If the application or the plans do not conform to the requirements of all pertinent laws, he shall reject such

application in writing, stating the reasons therefor. If he is satisfied that the proposed work conforms to the requirements of this code and all laws and ordinances applicable thereto, he shall issue a permit therefor as soon as practicable.

**113.2 Suspension of permit:** Any permit issued shall become invalid if the authorized work is not commenced within six (6) months after issuance of the permit, or if the authorized work is suspended or abandoned for a period of six (6) months after the time of commencing the work.

**113.3 Previous approvals:** This code shall not require changes in the plans, construction or designated use of a building for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which shall have been actively prosecuted within ninety (90) days after the effective date of this ordinance and completed with dispatch.

**113.4 Signature to permit:** The building official shall attach his signature to every permit; or he may authorize a subordinate to affix such signature thereto.

**113.5 Approved plans:** The building official shall stamp or endorse in writing both sets of corrected plans *Approved*, and one set of such approved plans shall be retained by him and the other set shall be kept at the building site, open to inspection of the building official or his authorized representative at all reasonable times.

**113.6 Revocation of permits:** The building official may revoke a permit or approval issued under the provisions of this code in case of any false statement or misrepresentation of fact in the application or on the plans on which the permit or approval was based.

**113.7 Approval of part:** The building official may issue a permit for the construction of foundations or any other part of a building or structure before the entire plans and specifications for the whole building or structure have been submitted, provided adequate information and detailed statements have been filed complying with all the pertinent requirements of this code. The holder of such permit for the foundations or other part of a building or structure shall proceed at his own risk with the building operation and without assurance that a permit for the entire structure will be granted.

**113.8 Posting of permit:** A true copy of the building permit shall be kept on the site of operations open to public inspection during the entire time of prosecution of the work and until the completion of the same.

**113.9 Notice of start:** At least twenty-four (24) hours notice of start of work under a building permit shall be given to the building official.

#### SECTION 114.0 CONDITIONS OF PERMIT

**114.1 Payment of fees:** A permit shall not be issued until the fees prescribed in Section 117.0 have been paid.

**117.8 Refunds:** In the case of a revocation of a permit or abandonment or discontinuance of a building project, the volume of the work actually completed shall be computed and any excess fee for the incomplete work shall be returned to the permit holder upon written request; except that all plan examination and permit processing fees and all penalties that may have been imposed on the permit holder under the requirements of this code shall first be collected.

### SECTION 118.0 VOLUME COMPUTATION

**118.1 General:** For the determination of the permit fees, the volume of the structure shall be computed as provided in this section.

**118.2 Structures with basements:** The volume of the structure shall include all enclosed dormers, porches, penthouses and other enclosed portions of the structure extending from the basement or cellar floor to the mean height of a pitched roof, or the average height to the top of the roof beams of a flat roof.

**118.3 Structures without basements:** For structures without basements or cellars, the volume shall be based on the height measured to a level located one-fifth ( $\frac{1}{5}$ ) the distance from the first floor level to the bottom of the footings, but not to exceed two and one-half ( $2\frac{1}{2}$ ) feet below the first floor level.

**118.4 Open sheds:** For open sheds and structures of a similar character, the volume shall be measured within the perimeter of the roof for a height from the grade line to the mean roof level.

### SECTION 119.0 CERTIFICATE OF USE AND OCCUPANCY

**119.1 New buildings:** A building or structure hereafter erected shall not be used or occupied in whole or in part until the certificate of use and occupancy shall have been issued by the building official.

**119.2 Buildings hereafter altered:** A building or structure hereafter enlarged, extended or altered to change from one use group to another or to a different use within the same use group, in whole or in part, and a building or structure hereafter altered for which a certificate of use and occupancy has not been heretofore issued, shall not be occupied or used until the certificate shall have been issued by the building official, certifying that the work has been completed in accordance with the provisions of the approved permit; except that any use or occupancy, which was not discontinued during the work of alteration, shall be discontinued within thirty (30) days after the completion of the alteration unless the required certificate is secured from the building official.

**119.3 Existing buildings:** Upon written request from the owner of an existing building or structure, the building official shall issue a certificate

of use and occupancy, provided there are not violations of law or orders of the building official pending, and it is established after inspection and investigation that the alleged use of the building or structure has heretofore existed. This code shall not require the removal, alteration or abandonment of, or prevent the continuance of, the use and occupancy of a lawfully existing building or structure, unless such use is deemed to endanger public safety and welfare.

**119.4 Changes in use and occupancy:** After a change of use has been made in a building or structure, the reestablishment of a prior use that would not have been legal in a new building of the same type of construction is prohibited unless the building complies with all applicable provisions of this code. A change from one prohibited use, for which a permit has been granted, to another prohibited use shall be deemed a violation of this code.

**119.5 Temporary occupancy:** Upon the request of the holder of a permit, the building official may issue a temporary certificate of occupancy for a building or structure, or part thereof, before the entire work covered by the permit shall have been completed, provided such portion or portions may be occupied safely prior to full completion of the building or structure without endangering life or public welfare.

**119.6 Contents of certificate:** When a building or structure is entitled thereto, the building official shall issue a certificate of use and occupancy within ten (10) days after written applications. The certificate shall certify compliance with the provisions of this code and the purpose for which the building or structure may be used in its several parts. The certificate of use and occupancy shall specify: the use group, in accordance with the provision of Article 2; the fire grading as defined in Article 2 and Table 902; the maximum live load on all floors as prescribed in Article 7; the occupancy load in the building and all parts thereof as defined in Article 2 and Article 6; and any special stipulations and conditions of the building permit.

## SECTION 120.0 POSTING STRUCTURES

**120.1 Posted use and occupancy:** Every building and structure and part thereof designed for business, factory and industrial, high hazard, mercantile, or storage use, (use groups B, F, H, M, and S) as defined in Article 2, shall be posted on all floors by the owner with a suitably designed placard in a form designated by the building official, which shall be securely fastened to the structure in a readily visible place, stating: the use group, the fire grading, the live load and the occupancy load.

**120.2 Posted occupancy load:** Every room constituting a place of assembly shall have the occupancy load of the room posted in a conspicuous place, near the main exit from the room. Approved signs shall be main-



tained in a legible manner by the owner or his authorized agent. Signs shall be durable and shall indicate the number of occupants permitted for each room use.

**120.3 Replacement of posted signs:** All posting signs shall be furnished by the owner and shall be of permanent design; they shall not be removed, or defaced and, if lost, removed or defaced, shall be immediately replaced.

**120.4 Periodic inspection:** The building official may periodically inspect all existing buildings and structures, except one- and two-family dwellings, for compliance with the law in respect to posting; or he may accept the report of such inspection from an authorized licensed professional engineer or architect; and such inspection and report shall specify any violation of the requirements of this code in respect to the posting of floor load, fire grading, occupancy load and use group of the building.

## SECTION 121.0 VIOLATIONS

**121.1 Unlawful acts:** It shall be unlawful for any person, firm or corporation to erect, construct, alter, extend, repair, remove, demolish, use or occupy any building or structure or equipment regulated by this code, or cause same to be done, contrary to or in conflict with or in violation of any of the provisions of this code.

**121.2 Notice of violation:** The building official shall serve a notice of violation or order on the person responsible for the erection, construction, alteration, extension, repair, removal, demolition, use or occupancy of a building or structure in violation of the provisions of this code, or in violation of a detail statement or a plan approved thereunder, or in violation of a permit or certificate issued under the provisions of this code; and such order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

**121.3 Prosecution of violation:** If the notice of violation is not complied with promptly, the building official shall request the legal counsel of the jurisdiction to institute the appropriate proceeding at law or in equity to restrain, correct or abate such violation or to require the removal or termination of the unlawful use of the building or structure in violation of the provisions of this code or of the order or direction made pursuant thereto.

**121.4 Violation penalties:** Any person who shall violate a provision of this code or shall fail to comply with any of the requirements thereof or who shall erect, construct, alter or repair a building or structure in violation of an approved plan or directive of the building official, or of a permit or certificate issued under the provisions of this code, shall be guilty of a [*specify offense*], punishable by a fine of not more than [*amount*], or by imprisonment not exceeding [*number of days*], or both such fine and



imprisonment. Each day that a violation continues shall be deemed a separate offense.

**121.5 Abatement of violation:** The imposition of the penalties herein prescribed shall not preclude the legal officer of the jurisdiction from instituting appropriate action to prevent unlawful construction or to restrain, correct or abate a violation, or to prevent illegal occupancy of a building, structure or premises or to stop an illegal act, conduct, business or use of a building or structure in or about any premises.

## SECTION 122.0 STOP-WORK ORDER

**122.1 Notice to owner:** Upon notice from the building official that work on any building or structure is being prosecuted contrary to the provisions of this code or in an unsafe and dangerous manner, such work shall be immediately stopped. The stop-work order shall be in writing and shall be given to the owner of the property involved, or to the owner's agent, or to the person doing the work; and shall state the conditions under which work may be resumed.

**122.2 Unlawful continuance:** Any person who shall continue any work in or about the structure after having been served with a stop-work order, except such work as he is directed to perform to remove a violation or unsafe conditions, shall be liable to a fine of not less than [amount] or more than [amount].

## SECTION 123.0 UNSAFE STRUCTURES

**123.1 Right of condemnation:** All buildings or structures that are or hereafter shall become unsafe, unsanitary, or deficient in adequate exit-way facilities, or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or which by reason of illegal or improper use, occupancy or maintenance, shall be deemed unsafe buildings or structures. All unsafe structures shall be taken down and removed or made safe and secure, as the building official may deem necessary and as provided in this section. A vacant building, unguarded or open at door or window, shall be deemed a fire hazard and unsafe within the meaning of this code.

**123.2 Examination and record of damaged structure:** The building official shall examine every building or structure reported as dangerous, unsafe structurally or constituting a fire hazard; and he shall cause the report to be filed in a docket of unsafe structures and premises, stating the use of the structure, the nature and estimated amount of damages, if any, caused by collapse or failure.

**123.3 Notice of unsafe structure:** If an unsafe condition is found in a building or structure, the building official shall serve on the owner, agent

or person in control of the building or structure a written notice describing the building or structure deemed unsafe and specifying the required repairs or improvements to be made to render the building or structure safe and secure, or requiring the unsafe building or structure or portion thereof to be demolished within a stipulated time. Such notice shall require the person thus notified to immediately declare to the building official his acceptance or rejection of the terms of the order.

**123.4 Restoration of unsafe structure:** A building or structure condemned by the building official may be restored to safe condition provided change of use or occupancy is not contemplated or compelled by reason of such reconstruction or restoration; except that if the damage or cost of reconstruction or restoration is in excess of fifty (50) per cent of its replacement value, exclusive of foundations, such structure shall be made to comply in all respects with the requirements for materials and methods of construction of structures hereafter erected.

**123.5 Posting unsafe notice:** If the person addressed with an unsafe notice cannot be found within the city after diligent search, then such notice shall be sent by registered or certified mail to the last known address of such person; and a copy of the unsafe notice shall be posted in a conspicuous place on the premises; and such procedure shall be deemed the equivalent of personal notice.

**123.6 Disregard of unsafe notice:** Upon refusal or neglect of the person served with an unsafe notice to comply with the requirements of the order to abate the unsafe condition, the legal counsel of the jurisdiction shall be advised of all the facts and he shall institute the appropriate action to compel compliance.

## SECTION 124.0 EMERGENCY MEASURES

**124.1 Vacating structures:** When, in the opinion of the building official, there is actual and immediate danger of failure or collapse of a building or structure or any part thereof which would endanger life, or when any structure or part of a structure has fallen and life is endangered by the occupation of the building or structure, the building official is hereby authorized and empowered to order and require the inmates and occupants to vacate the same forthwith. He shall cause to be posted at each entrance to such building a notice reading as follows: *This structure is unsafe and its use or occupancy has been prohibited by the building official*, and it shall be unlawful for any person to enter such building or structure except for the purpose of making the required repairs or of demolishing the same.

**124.2 Temporary safeguards:** When, in the opinion of the building official, there is actual and immediate danger of collapse or failure of a building or structure or any part thereof which would endanger life, he shall cause the necessary work to be done to render such building or

structure or part thereof temporarily safe, whether or not the legal procedure herein described has been instituted.

**124.3 Closing streets:** When necessary for the public safety, the building official may temporarily close sidewalks, streets, buildings and structures and places adjacent to such unsafe structure, and prohibit the same from being used.

**124.4 Emergency repairs:** For the purposes of this section, the building official shall employ the necessary labor and materials to perform the required work as expeditiously as possible.

**124.5 Costs of emergency repairs:** Costs incurred in the performance of emergency work shall be paid from the treasury of the jurisdiction on certificate of the building official; and the legal authority of the jurisdiction shall institute appropriate action against the owner of the premises where the unsafe building or structure was located for the recovery of such costs.

## SECTION 125.0 BOARD OF SURVEY

**125.1 Application for survey:** The owner of a building or structure or his duly authorized representative who has been served with an unsafe order and notice to make such structure safe, secure or habitable or to take down and remove such structure shall have the right, except in cases of emergency, to demand the appointment of a board of survey if he deems such order to be unnecessary, improper or unreasonable. Such demand shall be in writing with a statement of the reasons therefor.

**125.2 Constitution of board of survey:** The board of survey shall consist of three (3) persons, one (1) of whom shall be the building official or an assistant designated by him; another one (1) shall be the owner or his legal representative, or a licensed professional engineer or architect, or a qualified builder designated by the owner; and the third shall be a licensed professional engineer or architect chosen jointly by the other two (2) members, or designated by a justice of the court of record in case of failure of agreement.

**125.3 Compensation of board of survey:** The third member of the board shall receive for his services a fee of [amount] dollars to be paid by the appellant.

**125.4 Survey procedure:** The powers and duty of the board of survey shall be as indicated by the following Sections 125.4.1 and 125.4.2.

**125.4.1 Inspection of structure:** To inspect the building or structure and to confirm, modify or revoke the order of the building official as may seem just and proper in the interest of public safety and welfare.

**125.4.2 Determination of repair cost:** To determine the suitable cost

be determined to be legal; and it shall be presumed that this code would have been passed without such illegal or invalid parts or provisions.

**128.2 Segregation of invalid provisions:** Any invalid part of this code shall be segregated from the remainder of the code by the court holding such part invalid, and the remainder shall remain effective.

**128.3 Decisions involving existing structures:** The invalidity of any provision in any section of this code as applied to existing buildings and structures shall not be held to affect the validity of such section in its application to buildings and structures hereafter erected.

# ARTICLE 2

## DEFINITIONS AND CLASSIFICATIONS

### SECTION 200.0 GENERAL

**200.1 Scope:** The provisions of this article shall control the classification of all buildings as to use group and type of construction; and the definition of all terms relating thereto in [*name of jurisdiction*].

**200.2 Application of terms:** The terms herein defined shall be used to interpret all the applicable provisions of this code.

**200.3 Application of other laws:** The provisions of this article shall not be deemed to nullify any provisions of the zoning law or any other statute of [*name of jurisdiction*] pertaining to the location, use or type of construction of buildings, except as may be specifically required by the provisions of this code.

### SECTION 201.0 GENERAL DEFINITIONS

**201.1 Meaning:** Unless otherwise expressly stated, the following terms shall, for the purpose of this code have the meaning indicated in this section.

**201.2 Tense, gender and number:** Words used in the present tense include the future; words used in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural the singular.

**201.3 Terms not defined:** Where terms are not defined, they shall have their ordinarily accepted meanings or such as the context may imply.

**Accepted engineering practice:** That which conforms to accepted principles, tests or standards of nationally recognized technical or scientific authorities.

**Accessory structure:** A building the use of which is incidental to that of the main building and which is located on the same lot.

**Accessory use:** A use incidental to the principal use of a building as defined or limited by the provisions of the local zoning laws.

**Addition:** An extension or increase in floor area or height of a building or structure.

**Air-conditioning:** The treatment of air so as to control simultaneously its temperature, humidity, cleanness and distribution to meet the requirements of a conditioned space.

**Air duct:** A tube or conduit used for conveying air.

**Airplane hangar, private:** A hangar for the storage of four (4) or less single motor planes and in which volatile or flammable oil is not handled, stored or kept other than that contained in the fuel storage tank of the plane.

**Airplane hangar, public:** A building for the storage, care or repair of private or commercial airplanes not included in the term "private airplane hangar."

**Air supported structure:** A structural and mechanical system which is constructed of high strength fabric or film and achieves its shape, stability, and support by pretensioning with internal air pressure; air structures may be used for temporary applications.

**Alley:** A secondary thoroughfare less than thirty (30) feet in width dedicated for the public use of vehicles and pedestrians affording access to abutting property.

**Alteration:** As applied to a building or structure means a change or rearrangement in the structural parts or in the means of egress; or an enlargement, whether by extending on a side or by increasing in height; or the moving from one location or position to another.

**Amusement device:** A device or structure open to the public by which persons are conveyed or moved in unusual manner for diversion.

**Anchor store:** An anchor store is an exterior perimeter department store or major merchandising or magnet center having direct access to a mall and having its required exits independent of the mall.

**Apartment:** A "Dwelling unit" as defined in this code.

**Approved:** Approved by the building official or other authority having jurisdiction.

**Approved material, equipment and methods:** Material, equipment and methods evaluated and approved by the building official.

**Approved rules:** The legally adopted rules of the building official (see Section 108.0).

**Appurtenant structure:** A device or structure attached to the exterior or erected on the roof of a building designed to support service equipment or used in connection therewith, or for advertising or display purposes, or other similar uses.

**Architectural terra cotta:** Plain or ornamental hard-burned plastic clay units, larger in size than brick, with glazed or unglazed ceramic finish.

**Area (building):** The area included within surrounding exterior walls (or exterior walls and fire walls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if included within the horizontal projection of the roof or floor above.

**Areaway (form of construction):** An uncovered subsurface space adjacent to a building.

**Ashlar facing:** Facing of solid rectangular units larger in size than brick of burned clay or shale, natural or cast stone, with sawed, dressed and squared beds and mortar joints.

**Ashlar masonry:** Masonry composed of bonded, rectangular units, larger in size than brick, with sawed, dressed or squared beds and mortar joints.

**Attic:** The space between the ceiling beams of the top habitable story and the roof rafters.

**Attic (habitable):** A habitable attic is an attic which has a stairway as a means of access and egress and in which the ceiling area at a height of seven and one-third ( $7\frac{1}{3}$ ) feet above the attic floor is not less than one-third ( $\frac{1}{3}$ ) the area of the floor next below.

**Automatic:** As applied to fire protection devices, is a device or system providing an emergency function without the necessity of a human intervention and activated as a result of a predetermined temperature rise, rate of rise of temperature, or increase in the level of combustion products; such as incorporated in an automatic sprinkler system, automatic fire door, etc.

**Automatic collapsible revolving door:** A door which is designed, supported and constructed so that the wings will release and fold back in the direction of egress under pressure exerted by persons under panic conditions, providing a means of travel on both sides of the door pivot.

**Automatic detecting device:** A device which automatically detects heat, smoke or other products of combustion.

**Automatic fire alarm system:** A manual fire alarm system containing automatic detecting device(s) which actuates a fire alarm signal.

**Automatic fire door:** A fire door or other opening protective constructed and arranged so that, if open, it shall close when subjected to:

1. a predetermined temperature,
2. a predetermined rate of temperature rise, or
3. smoke or other products of combustion.

**Automatic sprinkler:** A device, connected to a water supply system, that

opens automatically at a predetermined fixed temperature and discharges a spray of water.

**Automatic sprinkler system:** A sprinkler system for fire protection purposes, is an integrated system of underground and/or overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The portion of the system above ground is a network of specially or hydraulically designed piping installed in a building, structure, or area, generally overhead, and to which automatic sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area.

**Automatic water supply:** Water supplied through a gravity or pressure tank or automatically operated fire pumps, or from a direct connection to an approved municipal water main.

**Basement:** That portion of a building which is partly below and partly above grade, and having at least one-half ( $\frac{1}{2}$ ) its height above grade (see "Grade," "Story" and "Cellar").

**Bay (part of a structure):** The space between two (2) adjacent piers or mullions or between two (2) adjacent lines of columns.

**Bay window:** A window projecting beyond the wall line of the building and extending down to the foundations.

**Boiler:** A closed heating appliance intended to supply hot water or steam for space heating, processing or power purposes.

**Low pressure and temperature**

**Steam:** Any boiler, generator, pressure vessel, system, piping or steam equipment used for the purpose of heating or distributing steam for heating, power or processing, operating at pressure of fifteen (15) pounds per square inch gauge (psig) or less, shall be classed as low pressure.

**Hot water:** Any boiler, generator, pressure vessel, system, piping or equipment used for the purpose of heating or distributing hot water for heating, supply or processing, operating at pressure not exceeding one hundred sixty (160) psig and temperatures not exceeding two hundred fifty (250) degrees F., shall be classed as low pressure.

**Exception:** Hot water supply boilers equipped with safety devices as required by the mechanical code listed in Appendix B and direct fired are considered outside the scope of this definition when the heat input is less than two hundred thousand (200,000) Btus per hour, the water temperature is less than two hundred (200) degrees F. and the capacity is less than one hundred twenty (120) gallons.

**High pressure and temperature**

**Steam:** Any boiler, generator, pressure vessel, system, piping or



equipment used for the purpose of heating or distributing steam for heating, power and processing, operating at pressure in excess of fifteen (15) psig, shall be classed as high pressure.

**Hot water:** Any boiler, generator, pressure vessel, system, piping or equipment used for the purpose of heating or distributing hot water for heating or processing, operating at pressures in excess of one hundred sixty (160) psig or temperatures in excess of two hundred fifty (250) degrees F., shall be classed as high pressure.

**Brick (clay or shale):** A solid masonry unit of clay or shale, usually formed into a rectangular prism while plastic and burned or fired in a kiln.

**Calcium-silicate brick (sand lime brick):** A building unit made of sand and lime.

**Concrete brick:** A solid masonry unit having a shape approximately a rectangular prism and composed of inert aggregate particles embedded in a hardened cementitious matrix.

**Hollow brick:** A masonry unit of clay or shale whose net cross-sectional area in any plane parallel to the bearing surface is not less than sixty (60) per cent or more than seventy-five (75) per cent of its gross cross-sectional area measured in the same plane.

**Building:** Any structure used or intended for supporting or sheltering any use or occupancy.

**Building (existing):** Any structure erected prior to the adoption of the appropriate code, or one for which a legal building permit has been issued.

**Building line:** The line established by law, beyond which a building shall not extend, except as specifically provided by law.

**Building official:** The officer or other designated authority charged with the administration and enforcement of this code, or his duly authorized representative.

**Building service equipment:** The mechanical, electrical and elevator equipment, including piping, wiring, fixtures and other accessories, which provide sanitation, lighting, heating, ventilation, fire-fighting and transportation facilities essential for the habitable occupancy of the building or structure for its designated use and occupancy.

**Building site:** The area occupied by a building or structure, including the yards and courts required for light and ventilation, and such areas that are prescribed for access to the street.

**Buttress:** A projecting part of a masonry wall built integrally therewith to furnish lateral stability which is supported on proper foundations.

**Carbon dioxide extinguishing system (CO<sub>2</sub>):** A system to supply CO<sub>2</sub>

from a pressurized vessel through fixed pipes and nozzles. The system includes an automatic detection and actuating mechanism.

**Cellar:** That portion of a building which is partly or completely below grade and having at least one-half ( $\frac{1}{2}$ ) its height below grade (see "Grade," "Story" and "Basement").

**Central station system:** A system, or group of systems, the operations of which are signaled to, recorded in, maintained and supervised from an approved central station, in which there are competent and experienced observers and operators in attendance at all times whose duty it shall be, upon receipt of a signal, to take such action as shall be required under the rules established for their guidance. Such systems shall be controlled and operated by a person, firm, or corporation whose principal business is the furnishing and maintaining of supervised protective signaling service and who does not have interest in the protected properties.

**Certificate of use and occupancy:** The certificate issued by the building official which permits the use of a building in accordance with the approved plans and specifications and which certifies compliance with the provisions of law for the use and occupancy of the building in its several parts together with any special stipulations or conditions of the building permit.

**Change of use:** An alteration by change of use in a building heretofore existing to a new use group which imposes other special provisions of law governing building construction, equipment or means of egress.

**Chimney:** A primarily vertical enclosure containing one (1) or more passageways.

**Factory-built chimneys:** A chimney that is factory-made, listed by a nationally recognized testing or inspection agency, for venting gas appliances, gas incinerators and solid or liquid fuel burning appliances.

**Masonry chimney:** A field constructed chimney of solid masonry units, bricks, stones, listed hollow masonry units or reinforced concrete built in accordance with nationally recognized standards.

**Metal chimney (smokestack):** A field constructed chimney made of metal and built in accordance with nationally recognized standards.

**Chimney connector:** A pipe which connects a fuel burning appliance to a chimney.

**Clay masonry unit:** A building unit larger in size than a brick, composed of burned clay, shale, fireclay or mixtures thereof.

**Closed sign:** A sign in which more than fifty (50) per cent of the entire area is solid or tightly enclosed or covered.

**Cold-formed steel construction:** That type of construction made up entirely, or in part, of steel structural members cold-formed to shape

from sheet or strip steel such as roof deck, floor and wall panels, studs, floor joists, roof joists and other structural elements.

**Combustible (material):** A combustible (material) is a material which cannot be classified as noncombustible in accordance with that definition.

**Concrete:** A mixture of cement, aggregates and water, of such proportions and manipulation as to meet specific requirements.

**Concrete masonry unit:** A building unit or block larger in size than twelve (12) by four (4) by four (4) inches made of cement and suitable aggregates.

**Conflagration hazard:** The fire risk involved in the spread of fire by exterior exposure to and from adjoining buildings and structures.

**Construction equipment:** The construction machinery, tools, derricks, hoists, scaffolds, platforms, runways, ladders and all material handling equipment safeguards and protective devices used in construction operations.

**Construction operation:** The erection, alteration, repair, renovation, demolition or removal of any building or structure; and the excavation, filling, grading and regulation of lots in connection therewith.

**Controlled construction:** The construction of a building or structure or a specific part thereof which has been designated and erected under the supervision of a licensed professional engineer or architect using controlled materials as herein defined in compliance with accepted engineering practice under the procedure of Section 127.0.

**Controlled materials:** Materials which are certified by an accredited authoritative agency as meeting accepted engineering standards for quality and as provided in Sections 719.0 and 800.0.

**Controlled materials procedure:** See Section 127.0.

**Corridor:** A hallway, passageway or other compartmented space providing the occupants with access to the required exitways of the building or floor area.

**Court:** An open, uncovered, and unoccupied space on the same lot with a building.

**Inner:** Any court other than an outer court.

**Outer:** A court extending to and opening upon a street, public alley, or other approved open space, not less than fifteen (15) feet wide, or upon a required yard.

**Covered mall buildings:** A covered mall building is a single building enclosing a number of tenants and occupancies such as retail stores, restaurants, places of assemblage, recreation facilities, motion picture

theaters, offices, banks, speciality shops and anchor stories but excluding high hazard (H) and institutional (I) occupancies and are of two types:

**Type A:** A covered mall building containing such occupancies in airport passenger terminals, hotel lobbies, department stores, discount stores, the lower stories of office buildings, etc. in which the allowable distance of travel from the most remote part of the buildings is measured to an exterior exit door, horizontal exit, exit passageway or an enclosed stairway.

**Type B:** A covered mall building wherein two (2) or more tenants have a main entrance into one (1) or more malls which are roofed interior areas providing common pedestrian facilities for the public wherein the distance of travel of one (1) of the exits from any point within a tenant space is measured to the mall.

**Curb level:** The elevation of the street curb as established in accordance with law.

**Building or wall height:** The elevation of the street grade opposite the center of the wall nearest to and facing the street lot line.

**Excavations:** The elevation of the street grade nearest to the point of excavation.

**Degree day, heating:** A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one (1) day, when the mean temperature is less than sixty-five (65) degrees F., there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and sixty-five (65) degrees F.

**Deluge system:** An automatic sprinkler system consisting of open sprinklers with water supply valves activated by a separate automatic detection system.

**Draft:** The pressure difference existing between the equipment or any component part and the atmosphere which causes a continuous flow of air and products of combustion through the gas passages of the appliance to the atmosphere.

**Forced draft:** The pressure difference created by the action of a fan, blower or ejector which supplies the primary combustion air above atmospheric pressure.

**Induced draft:** The pressure difference created by the action of a fan, blower or ejector which is located between the appliance and the chimney or vent termination.

**Natural draft:** The pressure difference created by a vent or chimney

due to its height and the temperature difference between the flue gases and the atmosphere.

**Draft hood:** A device built into a gas appliance or made a part of a chimney connector or vent connector from a gas appliance which is designed to:

1. permit the ready escape of flue gases in the event of zero draft, a back-draft or stoppage in the vent beyond the draft hood;
2. permit the ready relief of the back pressure from a back-draft so it does not enter the gas appliance; and
3. neutralize the possible effects of excess draft (stack action) upon the operation of the appliance.

**Draft regulator:** A device which functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value.

**Dry chemical extinguishing system:** A system consisting of dry chemical and expellant gas storage tanks, fixed piping, and nozzles used to assure proper distribution of an approved extinguishing agent on a specific fire hazard or into a potential fire area. The system includes an automatic detection and actuating mechanism.

**Dumbwaiter:** A hoisting and lowering mechanism with a car of limited capacity and size which moves in guides in a substantially vertical direction and is used exclusively for carrying material.

**Duct:** A tube or conduit used for conveying or encasing purposes as specifically defined below.

**Air duct:** A tube or conduit used for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

**Pipe duct:** A tube or conduit used for encasing pipe.

**Wire duct:** A tube or conduit used for encasing either moving or stationary wire, rope, etc.

## Dwellings

**Boarding house, tourist house:** A building arranged or used for lodging, with or without meals, for compensation, by more than five (5) and not more than twenty (20) individuals.

**Dormitory:** A space in a building where group sleeping accommodations are provided for persons not members of the same family group, in one (1) room, or in a series of closely associated rooms.

**Hotel:** Any building containing six (6) or more guest rooms intended or designed to be used, or which are used, rented or hired out to be occupied or which are occupied for sleeping purposes by guests.

**Lodging house:** Any building or portion thereof containing not more than five (5) guest rooms which are used by not more than five (5)

guests where rent is paid in money, goods, labor or otherwise. A lodging house shall comply with all the requirements for dwellings.

**Multi-family apartment house:** A building or portion thereof containing more than two (2) dwelling units and not classified as a one- or two-family dwelling.

**One-family dwelling:** A building containing one (1) dwelling unit with not more than five (5) lodgers or boarders.

**Two-family dwelling:** A building containing two (2) dwelling units with not more than five (5) lodgers or boarders per family but not more than twenty (20) individuals.

**Dwelling unit:** A single unit providing complete, independent living facilities for one (1) or more persons including permanent provisions for living, sleeping, eating, cooking, and sanitation.

**Elevator:** A hoisting and lowering mechanism equipped with a car or platform which moves in guides for the transportation of individuals or freight in a substantially vertical direction through successive floors or levels of a building or structure.

**Freight elevator:** An elevator primarily used for carrying freight and on which only the operator and the persons necessary for loading and unloading and employees having special permission of the building official are permitted to ride.

**Hand elevator:** A freight elevator that is driven by manual power.

**Hydraulic elevator:** A power elevator in which the motion of the car is obtained through the application of force from liquid under pressure.

**Passenger elevator:** An elevator for the transportation of individuals.

**Power elevator:** An elevator in which the motion of the car is obtained through the application of force other than by hand or gravity.

**Sidewalk elevator:** A freight elevator which operates between a sidewalk or other area exterior to the building and floor levels inside the building below such area, which does not have a landing opening into the building at its upper limit of travel and which is not used to carry automobiles.

**Elevator repairs:** All work necessary to maintain present elevator equipment in a safe and serviceable condition and to adjust or replace defective, broken or worn parts, with parts made of equivalent material, strength and design, and only where the replacing part performs the same function as the replaced part.

**Existing building:** A building erected prior to the adoption of this code, or one for which a legal building permit has been issued.

**Existing equipment:** Any equipment covered by this article which was installed prior to the effective date of this code or for which an application for permit to install was filed with the building official prior thereto.

**Exitway:** That portion of a means of egress which is separated from all other spaces of a building or structure by construction or equipment as required in this code to provide a protected way of travel to the exitway discharge.

**Exitway access:** Exitway access is that portion of a means of egress which leads to an entrance to an exitway.

**Exitway discharge:** That portion of a means of egress between the termination of an exitway and a public way.

**Exterior envelope:** The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior.

**Exterior masonry wall construction:** See Section 217.0.

**Fire area:** The floor area enclosed and bounded by fire walls or exterior walls of a building to restrict the spread of fire.

**Fire damper:** A damper arranged to seal off air flow automatically through part of an air duct system, so as to restrict the passage of heat. The fire damper may also be used as a smoke damper if location lends itself to the dual purpose.

**Fire department connection:** A connection for fire department use in supplementing or supplying water for standpipes or sprinkler systems.

**Fire door:** A door and its assembly, so constructed and assembled in place as to give protection against the passage of fire.

**Fire door assembly:** The assembly of a fire door and its accessories, including all hardware and closing devices and their anchors; and the door frame, when required, and its anchors.

**Fire grading:** The fire hazard classification of a building or structure in hours or fractions of an hour established for its use group and occupancy in Table 902.

**Fire hazard:** The potential degree of fire severity existing in the use and occupancy of a building and classified as high, moderate or low.

**High:** All uses which involve the storage, sale, manufacture or processing of highly combustible, volatile flammable or explosive products which are likely to burn with extreme rapidity and produce large volumes of smoke, poisonous fumes, gases or explosions in the event of fire.

**Moderate:** All uses which involve the storage, sale, manufacture or processing of materials which are likely to burn with moderate rapidity and a considerable volume of smoke, but which do not produce either poisonous fumes or explosions in the event of fire.

**Low:** All uses which involve the storage, sale or manufacture of materials that do not ordinarily burn rapidly, nor produce excessive smoke, poisonous fumes, or explosions in the event of fire.



**Fire limits:** The territories defined and limited by the provisions of this code for the restriction of types of construction.

**Fireproof construction:** See Section 215.0.

**Fire protection:** The provision of safeguards in construction and of exit facilities; and the installation of fire alarm, fire detecting and fire-extinguishing service equipment to reduce the fire risk and the conflagration hazard.

**Fire protection system:** A system including systems, devices, and equipment to detect a fire, actuate an alarm or suppress or control a fire or any combination thereof.

**Fireresistance:** That property of materials or their assemblies which prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

**Fireresistance rating:** The time in hours or fractions thereof that materials or their assemblies will resist fire exposure as determined by fire tests conducted in compliance with recognized standards.

**Fire separation, exterior fire exposure:** The distance in feet measured from the building face to the closest interior lot line, to the center line of a street or public space, or to an imaginary line between two buildings on the same property.

**Fire separation wall:** A fireresistance rated assembly of materials not having unprotected openings, designed to restrict the spread of fire.

**Fire suppression system:** A mechanical system designed and equipped to detect a fire, actuate an alarm and suppress or control a fire.

**Fire wall:** A fireresistance rated wall, having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof.

**Fire window:** A window constructed and glazed to give protection against the passage of fire.

**Flameresistance:** The property of materials or combinations of component materials which restricts the spread of flame as determined by the flameresistance tests specified in this code (see Section 904.0).

**Flame spread:** The propagation of flame over a surface.

**Flame spread rating:** The measurement of flame spread on the surface of materials or their assemblies as determined by tests conducted in compliance with recognized standards.

**Flammable:** Subject to easy ignition and rapid flaming combustion.

**Floor area, gross:** Gross floor area shall be the floor area within the perimeter of the outside walls of the building under consideration, without deduction for hallways, stairs, closets, thickness of walls, columns, or other features.



**Floor area, net:** For the purpose of determining the number of persons for whom exitways are to be provided, net floor area shall be the actual occupied area, not including accessory unoccupied areas or thickness of walls.

**Floor fill:** The fill between the structural floor arch or slab and the finished flooring.

**Floor filling:** The type of short-span floor construction in fireproof and fireresistive buildings installed between structural steel framing to serve as a combination structural floor slab or arch and fireproof protection of the framing.

**Floor finish:** The finish placed on top of the floor arch, slab or other structural floor element.

**Foam extinguishing system:** A special system to discharge a foam made from concentrates, either mechanically or chemically, over the area to be protected.

**Foundation wall:** A wall below the floor nearest grade serving as a support for a wall, pier, column or other structural part of a building.

**Foyer:** The enclosed space surrounding or in the rear of the auditorium of a theatre or other place of assembly which is completely shut off from the auditorium and is used as an assembly or waiting space for the occupants.

**Fuel oil:** A liquid mixture or compound derived from petroleum which does not emit flammable vapor below a temperature of one hundred and twenty-five (125) degrees F. in a Tag closed-cup tester (ASTM D56).

#### **Furnace**

**Floor furnace:** A self-contained, connected or vented furnace designed to be suspended from the floor of the space being heated taking air for combustion outside this heated space and with means for observing the flame and lighting the appliance from the space being heated.

**Forced warm air furnace:** A furnace equipped with a blower to provide the primary means for circulating air.

**Warm air furnace:** A solid, liquid or gas-fired appliance for heating air to be distributed with or without duct systems to the space to be heated.

**Garage, private:** A garage for four (4) or less passenger motor vehicles without provision for repairing or servicing such vehicles for profit.

**Garage, public:** A building or structure for the storage or parking of more than four (4) passenger motor vehicles or motor powered boats, or more than one (1) commercial motor vehicle; and in which provision may be made for the dispensing of gasoline, oil or similar products for

the servicing of such vehicles. Public garages shall be classified according to their specific use in one (1) of the following groups.

**Group 1:** A public garage in which provision is made for the care, storage, repair or painting of motor vehicles.

**Group 2:** A public garage used exclusively for passenger vehicles that will accommodate not more than nine (9) passengers.

**Grade:** A reference plane representing the average of finished ground level adjoining the building at all exterior walls.

**Grade hallway, grade lobby, grade passageway:** An enclosed hallway or corridor that is an element of an exitway, terminating at a street or an open space or court communicating with a street.

**Grandstand:** Any structure, except movable seating and sectional benches, intended primarily to support individuals for the purposes of assembly, but this definition shall not apply to the permanent seating in theatres, churches, auditoriums and similar buildings.

**Gross leasable area:** The gross leasable area is the total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the center lines of joint partitions to the outside of the tenant walls.

**Ground sign:** A sign supported by uprights or braces in or upon the ground surface.

**Habitable space:** Space in a structure for living, sleeping, eating, or cooking. Bathrooms, toilet compartments, closets, halls, storage or utility space, and similar areas are not considered habitable space.

**Halogenated extinguishing system:** A system of pipes, nozzles and an actuating mechanism and a container or halogenated agent under pressure.

**Heating appliance:** Any device designed or constructed for the generation of heat from solid, liquid or gaseous fuel or electricity.

**Recessed heater:** A completely self-contained heating unit usually recessed in a wall and located entirely above the floor of the space it is intended to heat.

**Unit heater:** A factory-assembled device designed to heat and circulate air. Essential components are a heat transfer element, housing and fan with driving motor. Normally designed for free delivery of recirculated air.

**Heated space:** A space within a building which is provided with a positive heat supply to maintain air temperature of fifty (50) degrees F. or higher.

**Height, building:** The vertical distance from the grade to the top of the highest roof beams of a flat roof, or to the mean level of the highest gable or slope of a hip roof. When a building faces on more

than one (1) street, the height shall be measured from the average of the grades at the center of each street front.

**Court:** The vertical distance from the lowest level of the court to the mean height of the top of the enclosing walls.

**Story:** The vertical distance from top to top of two (2) successive tiers of beams or finished floor surfaces; and, for the topmost story, from the top of the floor finish to the top of the ceiling joists, or, where there is not a ceiling, to the top of the roof rafters.

**Wall:** The vertical distance from the foundation wall or other immediate support of such wall to the top of the wall.

**Hereafter:** After the time that this code becomes effective.

**Heretofore:** Before the time that this code became effective.

**High hazard use:** See Section 206.0.

**Hollow masonry unit:** A masonry unit whose net cross-sectional area in any plane parallel to the bearing surface is less than seventy-five (75) per cent of its gross cross-sectional area measured in the same plane.

**Horizontal exit:** A way of passage from one (1) building or fire area to an area of refuge in another building or fire area on approximately the same level, which affords safety from fire or smoke from the area of escape and areas communicating therewith.

**Industrial lift (material lift):** A non-portable power operated raising or lowering device for transporting freight vertically, operating entirely within one (1) story of the building or structure.

**Interior lot line:** Any lot line other than one adjoining a street or public space.

**Jurisdiction:** The government unit which has adopted this code under due legislative authority.

**Kerosene:** An oil or liquid product of petroleum which does not emit a flammable vapor below a temperature of one hundred and fifteen (115) degrees F. when tested in a Tag closed-cup tester (ASTM D56).

**Light-diffusing system:** A suspended construction consisting in whole or in part of lenses, panels, grids or baffles suspended below independently-mounted electrical lighting sources.

**Limited area sprinkler system:** An automatic sprinkler system consisting of not more than twenty (20) sprinklers for use in a room or space enclosed by construction assemblies as required by this code.

**Lintel:** A beam placed over an opening or recess in a wall which supports the wall construction above.

## Load

**Dead load:** The weight of all permanent structural and non-structural

components of a building, such as walls, floors, roofs, and fixed service equipment.

**Duration of load:** The period of continuous application of a given load, or the aggregate of periods of intermittent applications of the same load.

**Earthquake load:** The assumed lateral load acting in any horizontal direction on the structural frame due to the kinetic action of earthquakes.

**Impact load:** The load resulting from moving machinery, elevators, craneways, vehicles, and other similar forces and kinetic loads.

**Lateral soil load:** The lateral pressure in pounds per square foot (psf) due to the weight of the adjacent soil, including due allowance for hydrostatic pressure and possible surcharge from fixed or moving loads.

**Live load:** The weight superimposed by the use and occupancy of the building, not including the wind load, earthquake load, or dead load.

**Wind load:** The lateral pressure on the building or structure in pounds per square foot (psf) due to wind blowing in any direction.

**Loading ramp:** A hinged, non-portable device, either mechanical or hydraulic, hand or power operated, used for spanning gaps or adjusting heights between loading surface and carrier or between loading surface and loading surface.

**Lobby:** The enclosed vestibule between the principal entrance to the building and the doors to the main floor of the auditorium or assembly room of a theatre or place of assembly, or to the main floor corridor of a business building.

**Lot:** A portion or parcel of land considered as a unit.

**Corner lot:** A lot with two (2) adjacent sides abutting upon streets or other public spaces.

**Interior lot:** A lot which faces on one (1) street or with opposite sides on two (2) streets.

**Lot line:** A line dividing one lot from another, or from a street or any public place.

**Low hazard use:** See Section 210.3.

**Mall:** A mall is a roofed over common pedestrian area serving more than one (1) tenant located within a covered mall building.

**Manual fire alarm system:** An interior alarm system composed of sending stations and signaling devices in a building, operated on an electric circuit, so arranged that the operation of any one (1) station will ring all signals throughout the building and at one (1) or more approved locations.

**Marquee sign:** A sign attached to or hung from a marquee canopy or other covered structure projecting from and supported by the building and extending beyond the building wall, building line or street lot line.

**Masonry:** A built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other approved units bonded together with mortar or monolithic concrete. Reinforced concrete is not classed as masonry.

**Material platform hoist:** A power or manually operated suspended platform conveyance operating in guide rails for the exclusive raising or lowering of materials, which is operated and controlled from a point outside the conveyance.

**Means of egress:** A continuous and unobstructed path of travel from any point in a building or structure to a public way and consists of three (3) separate and distinct parts: (a) the exitway access, (b) the exitway and (c) the exitway discharge; a means of egress comprises the vertical and horizontal means of travel and shall include intervening room spaces, doors, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

**Mechanical ventilation:** The mechanical process of supplying air to, or removing air from, any space.

**Mezzanine:** An intermediate level between the floor and ceiling of any story, and covering not more than thirty-three (33) per cent of the floor area of the room in which it is located.

**Miscellaneous hoisting and elevating equipment:** All power operated hoisting and elevating equipment for raising, lowering and moving persons or merchandise from one level to another such as inclined elevators, slings and hooks, tiering and piling machines not permanently located in a fixed position, mine elevators, skip hoists for blast furnaces, stage and orchestra lifts, lift-bridges and temporary builders' hoists and similar equipment.

**Mobile unit:** A structure of vehicular, portable design built on a chassis and designed to be moved from one site to another and to be used, with or without a permanent foundation.

**Moderate hazard use:** See Section 210.2.

**Mortar:** A plastic mixture of approved cementitious materials, fine aggregates and water used to bond masonry or other structural units.

**Motel:** A hotel as defined in this code.

**Motor fuel service station:** A structure, building or premise or any portion thereof where a flammable fluid is stored, housed or sold for supply to motor vehicles.

**Motor vehicle repair shop:** A building, structure or enclosure in which the general business of repairing motor vehicles is conducted, including a public garage.

**Moving stairway (escalator):** A power driven, inclined, continuous stairway used for raising and lowering passengers.

**Moving walk:** A type of passenger-carrying device on which passengers stand or walk, and in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted.

**Nominal dimension**

**Lumber:** A dimension that may vary from actual dimensions as provided in American Lumber Standard listed in Appendix C.

**Masonry:** A dimension that may vary from actual masonry dimensions by the thickness of a mortar joint but not to exceed one-half ( $\frac{1}{2}$ ) inch.

**Noncombustible:** This is a general, relative term. Its precise meaning is defined in this code for specific applications.

**Noncombustible building material (incombustible):** See Section 903.0.

**Noncombustible construction:** See Section 216.0.

**Non-slip:** As used in this code, shall mean a surface that is tested and approved to be slip resistant by a nationally recognized testing laboratory, and have a minimum coefficient of anti-slip friction of forty one-hundredths (0.40) as defined by Research Paper No. RP-1879 of the National Bureau of Standards.

**Occupancy:** The purpose for which a building, or part thereof, is used or intended to be used.

**Occupancy load:** The number of individuals normally occupying the building, or part thereof, or for which the exitway facilities have been designed.

**Occupancy sprinkler system:** An automatic sprinkler system servicing a use group in a building enclosed by construction assemblies as required by this code.

**Occupiable room:** A room or enclosed space designed for human occupancy in which individuals congregate for amusement, educational, or similar purposes or in which occupants are engaged at labor; and which is equipped with means of egress, light, and ventilation facilities meeting the requirements of this code.

**Occupiable room, minimum height:** A clear height from finished floor to ceiling or lowest projection of not less than seven and one-half ( $7\frac{1}{2}$ ) feet shall be provided in all exitway access and occupiable rooms of structures of assembly, business or mercantile uses.

**Occupied:** As applied to a building, shall be construed as though followed by the words "or intended, arranged or designed to be occupied."

**Open sign:** A sign in which at least fifty (50) per cent of the enclosed area is uncovered, or open to the transmission of wind.

**Ordinary materials:** Materials which do not conform to the requirements of this code for controlled materials.

- Oriel window:** A window projected beyond and suspended from the wall of the building or cantilevered therefrom.
- Owner:** Any person, agent, firm, or corporation having a legal or equitable interest in the property.
- Panel:** (Part of a structure.) The section of a floor or wall comprised between the supporting frame of two (2) adjacent rows of columns and girders or column bands of floor construction.
- Parking structure, open:** A structure for the parking of passenger cars wherein two (2) or more sides of such structure are not less than fifty (50) per cent open on each floor or level for fifty (50) per cent of the distance from the floor to the ceiling and wherein provision for the repairing of such vehicles is not made. Such open parking structures are not classified as public garages, but shall comply with the requirements of Section 429.0.
- Party wall:** A fire wall on an interior lot line used or adapted for joint service between two (2) buildings.
- Penthouse:** An enclosed structure above the roof of a building, other than a roof structure or bulkhead, occupying not more than thirty-three and one third (33⅓) per cent of the roof area.
- Permit:** An official document or certificate issued by the authority having jurisdiction authorizing performance of a specified activity.
- Person:** Includes a corporation or co-partnership as well as an individual.
- Place of assembly:** A room or space accommodating fifty (50) or more individuals for religious, recreational, educational, political, social or amusement purposes, or for the consumption of food and drink, including all connected rooms or space with a common means of egress and entrance.
- Place of outdoor assembly:** Premises used or intended to be used for public gatherings of two hundred (200) or more individuals in other than buildings.
- Plastic, combustible:** A plastic material more than one twentieth ( $\frac{1}{20}$ ) inches in thickness which burns at a rate of not more than two and one-half ( $2\frac{1}{2}$ ) inches per minute when subjected to ASTM D 635, Standard Method of Test for Flammability of Self-Supporting Plastics, listed in Appendix C.
- Plastic glazing:** Plastic materials which are glazed or set in frame or sash and not held by mechanical fasteners which pass through the glazing material.
- Plastic roof panels:** Plastic materials which are fastened to structural members, or to structural panels or sheathing, and which are used as light-transmitting media in roofs.



**Stage:** A partially enclosed portion of a building which is designed or used for the presentation of plays, demonstrations, or other entertainment wherein scenery, drops or other effects may be installed or used.

**Stairway:** One (1) or more flights of stairs, and the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one floor to another. A flight of stairs, for the purposes of this article, must have at least three (3) risers.

**Standard fire tests:** See Appendix G.

**Standpipe:** A wet or dry fire pipe line, extending from the lowest to the topmost story of a building or structure, equipped with a shut-off valve with hose outlets at every story.

**Steel joist:** Any secondary steel member of a building or structure made of hot or cold-formed solid or open-web sections, or riveted or welded bar, strip or sheet steel members or slotted and expanded or otherwise deformed rolled sections.

**Story:** That portion of a building included between the upper surface of a floor and upper surface of the floor or roof next above (see also "Mezzanine").

**Story (first):** The lowermost story entirely above the grade plane.

**Street:** A public thoroughfare (street, avenue, boulevard) which has been dedicated for public use.

**Street lot line:** The lot line dividing a lot from a street or other public space.

**Structural clay tile:** A hollow masonry unit composed of burned clay, shale, fireclay or mixtures thereof, and having parallel cells.

**Structural steel member:** Any primary or secondary member of a building or structure consisting of a rolled steel structural shape other than cold-formed steel, light gage steel or steel joist members.

**Structure:** That which is built or constructed.

**Temporary signs:** A sign constructed of cloth, fabric or other light temporary material with or without a structural frame intended for a limited period of display; including decoration displays for holidays or public demonstrations.

**Thermal transmittance (U):** Overall coefficient of heat transmission or thermal transmittance (air to air) expressed in units of BTU per hour per square foot per degree F. It is the time rate of heat flow. The U value applies to combinations of different materials used in series along the heat flow path and also to single materials that comprise a building section, and includes cavity air spaces and surface air films on both sides.



**Thermal transmittance ( $U_o$ ):** Overall (average) heat transmission or thermal transmittance of a gross area of the exterior building envelope, expressed in units of BTU per hour per square foot per degree F. The  $U_o$  value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floor, or roof/ceiling.

**Thermosetting material:** A plastic material which is capable of being changed into a substantially non-reformable product when cured.

**Thermoplastic material:** A plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

**Tile:** A ceramic surface unit, usually relatively thin in relation to facial area, made from clay or a mixture of clay and other ceramic materials, called the body of the tile, having either "glazed" or "unglazed" face and fired above red heat in the course of manufacture to a temperature sufficiently high to produce specific physical properties and characteristics.

**Use group:** The classification of a building or structure based on the purpose for which it is used.

**Use (used):** The purpose for which the building or structure is designed, used or intended to be used.

**Vent:** A conduit or passageway, vertical or nearly so, for conveying products of combustion to the outside atmosphere.

**Type B and Type B-W:** A gas venting system consisting of vent piping and fittings listed for use with a listed gas appliance.

**Type L:** A low temperature venting system, consisting of listing vent piping and fittings for use with oil-burning appliances listed for use with Type L vents, or with listed gas appliances.

**Vent connector:** The pipe used to connect an approved fuel-fired appliance to a chimney or vent.

**Vent system:** A continuous open passageway from the flue collar or draft hood of a fuel burning appliance to the outside atmosphere for the purpose of removing products of combustion.

**Ventilation:** The process of supplying air to, or removing air from, any space. Such air may or may not have been conditioned.

**Vertical opening:** An opening through a floor or roof.

## Wall

**Apron wall:** That portion of a skeleton wall below the sill of a window.

**Bearing wall:** A wall supporting any vertical load in addition to its own weight.

**Cavity wall:** A wall built of masonry units or of plain concrete, or a combination of these materials, arranged to provide an air space within the wall, and in which the inner and outer parts of the wall are tied together with metal ties.

**Composite wall:** A wall built of a combination of two (2) or more masonry units of different materials bonded together, one (1) forming the back-up and the other the facing elements.

**Curtain wall:** A non-bearing enclosure wall not supported at each story.

**Division wall:** A wall used to divide the floor area of a building or structure into separate parts for fire protection, for different uses, for restricted occupancy, or other purposes specified in this code.

**Faced wall:** A wall in which the masonry facing and backing are so bonded as to exert common action under load.

**Hollow wall:** A wall built of masonry units so arranged as to provide an air space within the wall, and in which the facing and backing of the wall are bonded together with masonry units.

**Non-bearing wall:** A wall which does not support vertical load other than its own weight.

**Parapet wall:** That part of any wall entirely above the roof line.

**Retaining wall:** A wall designed to resist the lateral displacement of soil or other material.

**Skeleton or panel wall:** A nonbearing wall supported by each story on a skeleton frame.

**Spandrel wall:** That portion of a skeleton wall above the head of a window or door.

**Veneered wall:** A wall having a facing of masonry or other weather-resisting noncombustible materials securely attached to the backing, but not so bonded as to exert common action under load.

**Wall sign:** A sign which is painted on or attached directly to a fence or on the surface of masonry, concrete, frame or other approved building walls, and which extends not more than fifteen (15) inches from the face of the fence or wall.

**Water spray fixed system:** A system using water in a form having a predetermined pattern, particle size, velocity, and density discharged from specially designed nozzles or devices.

**Width**

**Inner court:** As applied to an inner court, means its least horizontal dimension.

**Outer court:** As applied to an outer court, means the shortest horizontal dimension measured in a direction substantially parallel with the principal open end of such court.

**Winder:** A step in a winding stairway.

**Writing:** The term shall be construed to include handwriting, type-writing, printing, photo-offset or any other form of reproduction in legible symbols or characters.

**Written notice:** A notification in writing delivered in person to the individual or parties intended, or delivered at, or sent by certified or registered mail to the last residential or business address of legal record.

**Yard:** An unoccupied open space other than a court.

**Zoning:** The reservation of certain specified areas within a community or city for building and structures, or use of land, for certain purposes with other limitations such as height, lot coverage and other stipulated requirements.

**SECTION 202.0 USE GROUP CLASSIFICATION**

**202.1 General:** All buildings and structures shall be classified with respect to use in one (1) of the following use groups listed below.

1. Use group A assembly (see Section 203.0).
2. Use group B business (see Section 204.0).
3. Use group F factory and industrial (see Section 205.0).
4. Use group H high hazard (see Section 206.0).
5. Use group I institutional (see Section 207.0).
6. Use group M mercantile (see Section 208.0).
7. Use group R residential (see Section 209.0).
8. Use group S storage (see Section 210.0).
9. Use group T temporary and miscellaneous (see Section 211.0).

**202.2 Fire grading of buildings:** All buildings and structures shall be graded in accordance with the degree of fire hazard of their use in terms of hours and fractions of an hour and as regulated by Section 902.0.

**202.3 New uses:** The building official shall establish by approved rules the degree of hazard involved and the fire grading of any use not specifically provided for in this code.

**SECTION 203.0 USE GROUP A, ASSEMBLY BUILDINGS**

**203.1 General:** All buildings and structures, or parts thereof, shall be

**Table 203.7 (cont'd.)**  
**ASSEMBLY BUILDINGS REGULATIONS GUIDE**

Means of egress: (continued)	Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Smokeproof enclosures 618.0 Exterior exitway stairways 619.0 Panic hardware 612.5.2 (also see Sections 417.0 and 418.0)
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Manual fire alarm systems 1217.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0 Fire ventilation of open wells 520.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0 Inspection of hazardous uses 403.1
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skiylights 1905.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped, plumbing fixtures 315.8
Electrical wiring:	Article 15
Motion picture protection rooms:	Use and storage of flammable films 408.0 Projection rooms, construction 408.3
Stages and platforms:	Stage construction 417.7 Dressing rooms 417.8
Provisions for the handicapped and aged:	Section 315.0
Energy conservation:	Article 20

**SECTION 204.0 USE GROUP B, BUSINESS BUILDINGS**

**204.1 General:** All buildings and structures or parts thereof shall be classified in the business (B) use group which are used for the transaction of business for the rendering of professional services, or for other services that involve stocks of goods, wares or merchandise in limited quantities for use incidental to office uses or sample purposes; including among others offices, banks, civic administration activities, fire houses, police stations, professional services, testing and research laboratories, radio stations, telephone exchanges, motor fuel service stations and similar establishments.

**204.2 Regulations guide:** The following listing contained in Table 204.2 is a guide to the principal requirements of this code applicable to use group B, business buildings. They are not necessarily the only, nor all of the provisions with which compliance is required. Omission of reference to any provision shall not nullify any requirement of this code, nor exempt any structure from such requirement.

**Table 204.2  
BUSINESS BUILDINGS REGULATIONS GUIDE**

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Historic buildings 316.0 Motor fuel service stations 415.0 Open parking structures 429.0 High rise buildings 431.0
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9 Unlimited area buildings 307.0
Allowable height:	General height limitations 305.0 Height exceptions 308.0
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Mixed use and occupancy 213.0 Vertical shafts 910.0 Fireresistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0
Fire limit requirements:	Restrictions within fire limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0
Fireresistance:	Fire hazard classification 902.0 Fireresistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4

**Table 204.2 (cont'd.)**  
**BUSINESS BUILDINGS REGULATIONS GUIDE**

Fireresistance: (continued)	Fire-retardant treated wood 903.6 Fireresistance of structural members 911.0 Fireresistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Fire stopping 919.0 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0 Shipping areas 905.5 Grade floor protection 905.7
Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Smokeproof enclosures 618.0 Exterior exitway stairways 619.0 Buildings with one exitway 609.3
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 431.0 and Article 12 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Automatic fire alarm systems 1216.0 Manual fire alarm systems 1217.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0 Fire ventilation of open wells 520.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0

Table 204.2 (cont'd.)  
BUSINESS BUILDINGS REGULATIONS GUIDE

Light and ventilation: (continued)	Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped, plumbing fixtures 315.8
Electrical wiring:	Article 15
Provisions for the handicapped and aged:	Section 315.0
Energy conservation:	Article 20

### SECTION 205.0 USE GROUP F, FACTORY AND INDUSTRIAL BUILDINGS

**205.1 General:** All buildings and structures, or parts thereof, in which occupants are engaged in performing work or labor in fabricating, assembling or processing of products or materials, shall be classified in the factory and industrial (F) use group; including, among others, factories, assembling plants, industrial laboratories and all other industrial and manufacturing uses, except those involving highly combustible, flammable or explosive products and materials of the high hazard use group (use group H).

**205.2 List of factory and industrial uses:** The processes and manufacturers listed in the following Table 205.2 shall be indicative of, and include, the uses permitted in use group F buildings.

Table 205.2  
USE GROUP F, FACTORY AND INDUSTRIAL USES

Bakeries	Ice plants
Boiler works	Leather and tanneries, excluding enameling or japanning
Breweries	Millwork and woodworking
Canneries, including food products	Sugar refineries
Condensed and powered milk manufacture	Tenant factories, excluding ladies' dresses and other high hazard uses.
Dry cleaning using other than volatile flammable liquids in cleaning or dyeing operations or other than classified in Table 206.3	Textile mills, including canvas, cotton cloth, bagging, burlap, carpets and rags
Electric light plants and power houses	Upholstery and manufacturing shops
Electrolytic reducing works	Water-pumping plants
Glass plants	

**205.3 Special industrial uses:** All buildings and structures designed to house low hazard industrial processes, including, among others, the production and distribution of electric, gas or steam power and rolling mills and foundries, requiring large areas and unusual heights to accommodate craneways or special machinery and equipment, shall be exempt from the height and area limitations of Table 305.

**205.3.1 Construction:** Buildings and structures for such special industrial uses shall comply with the requirements of Section 307.0, except as to height, and when constructed of noncombustible (Type 2C) construction may have balconies and mezzanine floors which do not exceed two-thirds ( $\frac{2}{3}$ ) the area of the main floor in any one (1) tier.

**205.3.2 Exterior walls:** The exterior walls of buildings of such low hazard industrial uses shall be constructed of approved noncombustible and weather resisting materials, and, when located with a fire separation of less than thirty (30) feet from interior lot lines of any other building, shall be protected or constructed to provide a fireresistance rating of not less than two (2) hours.

**205.3.3 Fire protection systems:** Special use industrial buildings as herein defined shall comply with the requirements of Article 12 for fire protection systems; except that the provisions of Section 307.0 for automatic fire suppression systems in unlimited area buildings may be waived by the building official when such installations would be detrimental or dangerous to the specific use and occupancy.

**205.4 Regulations guide:** The following listing contained in Table 205.4 is a guide to the principal requirements of this code applicable to use group F, factory and industrial buildings. They are not necessarily the only, nor all, of the provisions with which compliance is required. Omission of reference to any provision shall not nullify any requirement of this code, nor exempt any structure from such requirement.

**Table 205.4**  
**FACTORY AND INDUSTRIAL BUILDINGS REGULATIONS GUIDE**

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Historic buildings 316.0
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9 Unlimited area buildings 307.0
Allowable height:	General height limitations 305.0 Height exceptions 308.0
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Mixed use and occupancy 213.0 Vertical Shafts 910.0 Fireresistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0



Table 205.4 (cont'd.)

**FACTORY AND INDUSTRIAL BUILDINGS REGULATIONS GUIDE**

Fire limit requirements:	Restrictions within fire limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0
Fireresistance:	Fire hazard classification 902.0 Fireresistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4 Fire-retardant treated wood 903.6 Fireresistance of structural members 911.0 Fireresistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Fire stopping 919.0 and 875.9 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0 Grade floor protection 905.7
Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Smokeproof enclosures 618.0 Exterior exitway stairways 619.0
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0 Special permits 404.0 Paint spraying 411.0 Dry cleaning establishments 412.0

Table 205.4 (cont'd.)

FACTORY AND INDUSTRIAL BUILDINGS REGULATIONS GUIDE

Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0 Drying rooms 1106.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped, plumbing fixtures 315.8
Electrical wiring:	Article 15
Provisions for the handicapped and aged:	Section 315.0
Energy conservation:	Article 20

SECTION 206.0 USE GROUP H, HIGH HAZARD BUILDINGS

**206.1 General:** All buildings and structures, or parts thereof, shall be classified in the high hazard (H) use group which are used for the storage, manufacture or processing of highly combustible or explosive products or materials, which are likely to burn with extreme rapidity, or which may produce poisonous fumes or explosions; for storage or manufacturing which involves highly corrosive, toxic or noxious alkalies, acids or other liquids or chemicals producing flame, fume, poisonous, irritant or corrosive gases; and for the storage or processing of any materials producing explosive mixtures of dust, or which result in the division of matter into fine particles subject to spontaneous ignition.

**206.2 List of high hazard uses:** The processes, materials and manufactures listed in the following Table 206.2 are indicative of and shall be included among high hazard uses.

Table 206.2

USE GROUP H, HIGH HAZARD USES

Acetylene gas and gases under pressure of fifteen (15) pounds or more and in quantities of greater than twenty-five hundred (2500) cubic feet; including hydrogen, illuminating, natural, ammonia, chlorine, phosgene, sulphur dioxide, carbon monoxide, methyl oxide and all gases subject to explosion, fume or toxic hazard	Artificial flowers and synthetic leather manufacture Celluloid and celluloid products Cereal, feed, flour and grist mills Cotton batting and cotton waste processes Cotton dressmaking Dry cleaning establishments using or storing more than three (3) gallons of gasoline or other hazardous liquids with a flash point under one hundred (100) degrees F., or more
Ammunition, explosives and fireworks manufacture	

Table 206.2 (cont'd.)  
USE GROUP H, HIGH HAZARD USES

than sixty (60) gallons of volatile flammable liquids with flash point between one hundred (100) and one hundred and forty (140) degrees F., in a closed-cup tester (ASTM D56).	Paint and varnish manufacture
Feather renovating	Paint spraying or dipping
Fruit ripening processes	Petroleum manufacture
Grain elevators	Processing of paper or cardboard in loose form
Hydrogenation processes	Pyroxylin products manufacture and storage
Industries employing solids or substances which ignite or produce flammable gases on contact with water	Rag sorting and storage
Kerosene, fuel, lubricating, or any oil storage with a flash point under two hundred (200) degrees F.	Refrigerating systems using high hazard refrigerants as defined in the mechanical code
Match manufacture or storage	Shoddy mills
Metal enameling or japanning	Shoe polish manufacture
Nitro-cellulose film exchanges and laboratories	Smoke houses (industrial)
	Straw goods manufacture or broom corn storage
	Sugar and starch pulverizing mills
	Tar, pitch or resin processing
	Tanneries with enameling or japanning
	Tire storage warehouse
	Waste paper sorting, shredding, storage or baling

**206.3 Regulations guide:** The following listing contained in Table 206.3 is a guide to the principal requirements of this code applicable to use group H, high hazard buildings. They are not necessarily the only, nor all, of the provisions with which compliance is required. Omission of reference to any provision shall not nullify any requirement of this code, nor exempt any structure from such requirement.

Table 206.3  
HIGH HAZARD BUILDINGS REGULATIONS GUIDE

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Historic buildings 316.0 Special high hazards 400.3
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9
Allowable height:	General height limitations 305.0 Height exceptions 308.0
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Mixed use and occupancy 213.0 Vertical shafts 910.0 Fire resistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0
Fire limit requirements:	Restrictions within limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0

Table 206.3 (cont'd.)

## HIGH HAZARD BUILDINGS REGULATIONS GUIDE

Fireresistance:	Fire hazard classification 902.0 Fireresistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4 Fire-retardant-treated wood 903.6 Fireresistance of structural members 911.0 Fireresistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Firestopping 919.0 and 875.9 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0 Grade floor protection 905.7
Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Exterior exitway stairway 619.0 Slidescapes 622.0
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0 Fire ventilation of open wells 520.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0 Explosion hazards 401.0 Volatile flammables 402.0 Outside aboveground storage 402.2.2 Inspection of hazardous uses 403.1 Special permits 404.0

Table 206.3 (cont'd.)

HIGH HAZARD BUILDINGS REGULATIONS GUIDE

Hazardous area: (continued)	Combustible dusts, grain processing and storage 410.0 Combustible fibers, construction requirements 409.2 Paint spraying 411.0 Dry cleaning establishments 412.0
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped, plumbing fixtures 315.8
Electrical wiring:	Article 15
Provisions for the handicapped and aged:	Section 315.0
Energy conservation:	Article 20

SECTION 207.0 USE GROUP I, INSTITUTIONAL BUILDINGS

**207.1 General:** All buildings and structures, or parts thereof, shall be classified in the institutional (I) use group in which people suffering from physical limitations because of health or age are harbored for medical or other care or treatment, or in which people are detained for penal or correctional purposes, or in which the liberty of the inmates is restricted.

**207.2 Use group I-1:** This use group shall include all buildings designed for the detention of people under restraint, including, among others, jails, prisons, reformatories, insane asylums and similar uses.

**207.3 Use group I-2:** This use group shall include all buildings used for housing people suffering from physical limitations because of health or age, including, among others, day nurseries, hospitals, sanitariums, clinics, infirmaries, orphanages, and homes for aged and infirm.

**207.4 Regulations guide:** The following listing contained in Table 207.4 is a guide to the principal requirements of this code applicable to use group I, institutional buildings. They are not necessarily the only, nor all, of the provisions with which compliance is required. Omission of reference to any provision shall not nullify any requirement of this code, nor exempt any structure from such requirement.

**Table 207.4**  
**INSTITUTIONAL BUILDINGS REGULATIONS GUIDE**

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Historic buildings 316.0
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9 Unlimited area buildings 307.0
Allowable height:	General height limitations 305.0 Height exceptions 308.0
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Mixed use and occupancy 213.0 Vertical shafts 910.0 Fire-resistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0
Fire limit requirements:	Restrictions within fire limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0
Fire-resistance:	Fire hazard classification 902.0 Fire-resistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4 Fire-retardant treated wood 903.6 Fire-resistance of structural members 911.0 Fire-resistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Firestopping 919.0 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0 Grade floor protection 905.7
Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0

Table 207.4 (cont'd.)

INSTITUTIONAL BUILDINGS REGULATIONS GUIDE

Means of egress: (continued)	Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Smokeproof enclosures 618.0 Slidescapes 622.0 Revolving doors 613.0
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Fire emergency ventilating system 519.0 Automatic fire alarm systems 1216.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped, plumbing fixtures 315.8
Electrical wiring:	Article 15
Provisions for the handicapped and aged:	Section 315.0
Energy conservation:	Article 20

SECTION 208.0 USE GROUP M, MERCANTILE BUILDINGS

**208.1 General:** All buildings and structures or parts thereof shall be classified in the mercantile (M) use group which are used for display and sales purposes involving stocks of goods, wares or merchandise incidental to such purposes and accessible to the public; including, among others, retail stores, shops and salesrooms and markets. Highly combustible goods, such as merchandise made of pyroxylin products, shall be limited to small quantities that do not constitute a high hazard; and if not so limited, the construction shall comply with the requirements of the

**Table 210.4**  
**STORAGE BUILDINGS REGULATIONS GUIDE**

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Historic buildings 316.0 Motor vehicle repair shops 416.0 Open parking structures 429.0
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9 Unlimited area buildings 307.0
Allowable height:	General height limitations 305.0 Height exceptions 308.0
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Public garages 414.0 Mixed use and occupancy 213.0 Vertical shafts 910.0 Fireresistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0
Fire limit requirements:	Restrictions within fire limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0
Fireresistance:	Fire hazard classification 902.0 Fireresistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4 Fire-retardant treated wood 903.6 Fireresistance of structural members 911.0 Fireresistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Firestopping 919.0 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0 Grade floor protection 905.7
Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0



Table 210.4 (cont'd.)

STORAGE BUILDINGS REGULATIONS GUIDE

Means of egress: (continued)	Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Exterior exitway stairways 619.0
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0 Supervision 1218.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0 Fire ventilation of open wells 520.0
Hazardous area:	Boiler and equipment rooms 400.6 Segregation of storage space 400.8 Existing buildings 405.0 Pyroxylin plastics 407.0 Outside aboveground storage 402.2.2 Inspection of hazardous uses 403.1 Special permits 404.0
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0 Drying rooms 1106.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Handicapped plumbing fixtures 315.8
Electrical wiring:	Article 15
Provisions for the physically handicapped and aged:	Section 315.0
Energy conservation:	Article 20

**SECTION 211.0 USE GROUP T, TEMPORARY AND MISCELLANEOUS USES**

**211.1 General:** Structures and buildings of a temporary character and miscellaneous structures not classified in any specific use group shall be constructed, equipped and maintained to meet the requirements of this code commensurate with the fire and life hazard incidental to their use. Miscellaneous uses shall include all accessory buildings and structures used as private garages, sheds, fences and similar purposes.

**211.2 Regulations guide:** The following listing contained in Table 211.2 is a guide to the principal requirements of this code applicable to use group T, temporary and miscellaneous buildings. They are not necessarily the only, nor all of the provisions with which compliance is required. Omission of reference to any provision shall not nullify any requirement of this code, nor exempt any structure from such requirement.

**Table 211.2**  
**TEMPORARY AND MISCELLANEOUS BUILDINGS REGULATIONS GUIDE**

Types of construction:	Construction classification 214.0 Mixed use and occupancy 213.0 Temporary structures 314.0 Tents and air supported structures 422.0 Builders shanties and reviewing stands 302.4 Signs Article 14
Allowable area:	General area limitations 305.0 Area exceptions 306.0 Subdivision of attic spaces 875.9 Temporary projections 312.0
Allowable height:	General height limitations 305.0 Height exceptions 308.0 Bins, tanks and towers 302.5 Storm enclosures 302.3
Fire separations:	Fire walls and party walls 907.0 Fire separation walls 909.0 Elevator opening protectives 1613.0 Automatic fire doors and dampers 903.0 Mixed use and occupancy 213.0 Vertical shafts 910.0 Fireresistance rated floor/roof assemblies 912.0
Exterior wall protection:	Exterior walls 906.0 Exterior opening protectives 914.0 Glazing of unprotected openings 1902.0
Fire limit requirements:	Restrictions within fire limits 302.0 Restrictions outside fire limits 303.0 Roof structures 925.0
Fireresistance:	Fire hazard classification 902.0 Fireresistance tests 903.0 Roof coverings 903.3 Opening protectives 903.4 Fire-retardant treated wood 903.6 Fireresistance of structural members 911.0 Fireresistance rated floor/roof assemblies 912.0 Roof construction 913.0 Fire windows and shutters 916.0 Firestopping 919.0 Balconies 924.0 Roof structures 925.0 Roof coverings 926.0 Refuse vaults, enclosure requirements 1108.0

Table 211.2 (cont'd.)

TEMPORARY AND MISCELLANEOUS BUILDINGS REGULATIONS GUIDE

Interior finish:	Interior finish and trim 920.0 Application of interior finish 921.0 Flame resistance tests 904.0
Means of egress:	Occupancy load 606.0 Location 607.0 Capacity 608.0 Number of exitways 609.0 Exitway access corridors 610.0 Grade passageways 611.0 Means of egress doorways 612.0 Horizontal exits 614.0 Interior exitway stairways 616.0 Access to roof 617.0 Exit signs 623.0 Means of egress lighting 624.0 Elevator, exitway restrictions 1610.0 Exterior exitway stairways 619.0
Fire protection systems:	Water sprinkler systems 1204.0 Fire suppression systems 1202.0 Standpipe systems 1211.0 Fire department connections 1213.0 Water supply 1214.0
Vertical openings:	Shafts 515.0 Firestopping 919.0 Vertical shafts and hoistways 910.0 Hoistway enclosures and venting 1609.0 Fire ventilation of open wells 520.0
Hazardous area:	Boiler and equipment rooms 400.6 Refrigeration of storage space 400.8 Existing buildings 405.0
Light and ventilation:	Bath and toilet rooms 512.0 Required fresh air supply 514.0 Ventilation of shafts 515.0 Artificial light and ventilation 504.0 Natural light and ventilation 506.0 Air-conditioning, refrigeration and mechanical ventilation (see mechanical code listed in Appendix B) Skylights 1905.0
Sanitation:	Plumbing and drainage Article 17 Termite protection 874.0 Plumbing and water connections 1807.0
Electrical wiring:	Article 15

SECTION 212.0 DOUBTFUL USE CLASSIFICATION

**212.1 General:** When a building or structure is proposed for a use not specifically provided for in this code or the classification of which is doubtful, such building or structure shall be included in the use group which it most nearly resembles in respect to the existing or proposed life and fire hazard, and it shall be so classified by the building official.

**217.2.1 Columns:** Wood columns may be sawn or glued laminated and shall be not less than eight (8) inches, nominal, in any dimension when supporting floor loads and not less than six (6) inches, nominal, in width and not less than eight (8) inches, nominal, in depth when supporting roof and ceiling loads only.

**217.2.2 Floor framing:** Beams and girders of wood may be sawn or glued laminated and shall be not less than six (6) inches, nominal, in width and not less than ten (10) inches, nominal, in depth. Framed or glued laminated arches which spring from the floor line and support floor loads shall be not less than eight (8) inches, nominal, in any dimension. Framed timber trusses supporting floor loads shall have members of not less than eight (8) inches, nominal, in any dimension.

**217.2.3 Roof framing:** Framed or glued laminated arches for roof construction which spring from the floor line or from grade and do not support floor loads shall have members not less than six (6) inches, nominal, in width and not less than eight (8) inches, nominal, in depth for the lower half of the height and not less than six (6) inches, nominal, in depth for the upper half. Framed or glued laminated arches for roof construction which spring from the top of walls or wall abutments, framed timber trusses, and other roof framing which do not support floor loads, shall have members not less than four (4) inches, nominal, in width and not less than six (6) inches, nominal, in depth. Spaced members may be composed of two (2) or more pieces not less than three (3) inches, nominal, in thickness when blocked solidly throughout their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate of not less than two (2) inches, nominal in thickness, secured to the underside of the members. Splice plates shall be not less than three (3) inches, nominal, in thickness. When protected by approved automatic sprinklers under the roof deck, framing members shall be not less than three (3) inches, nominal, in width.

**217.2.4 Flooring:** Floors shall be without concealed spaces and shall be of sawn or glued laminated plank, splined, or tongue-and-groove, of not less than three (3) inches, nominal, in thickness covered with one (1) inch, nominal, dimension tongue-and-groove flooring, laid crosswise or diagonally, or one-half ( $\frac{1}{2}$ ) inch plywood, or one-half ( $\frac{1}{2}$ ) inch particle board; or of planks not less than four (4) inches, nominal, in width, set on edge close together and well spiked, and covered with one (1) inch, nominal, dimension flooring, or one-half ( $\frac{1}{2}$ ) inch plywood, or one-half ( $\frac{1}{2}$ ) inch particle board.

**217.2.5 Roof decking:** Roofs shall be without concealed spaces and roof decks shall be sawn or glued laminated, splined or tongue-and-groove plank, not less than two (2) inches, nominal, in thickness, one and one-eighth ( $1\frac{1}{8}$ ) inches thick interior plywood (exterior glue), or of planks not less than three (3) inches, nominal, in width, set on edge close to-

gether and laid as required for floors. Other types of decking may be used if providing equivalent fireresistance rating and structural properties.

**217.2.6 Bearing walls:** Bearing portions of exterior and interior walls shall be of approved noncombustible material and shall have a fireresistance rating of not less than two (2) hours.

**217.2.7 Non-bearing walls:** Non-bearing portions of exterior walls shall be of approved noncombustible materials, except as otherwise noted and where a horizontal separation of less than twenty (20) feet is provided, nonbearing exterior walls shall have a fireresistance rating of not less than two (2) hours. Where a horizontal separation of twenty (20) feet to thirty (30) feet is provided, non-bearing exterior walls shall have a fireresistance rating of not less than one (1) hour. Where a horizontal separation of thirty (30) feet or more is provided, fireresistance rating is not required. Where a horizontal separation of twenty (20) feet or more is provided, wood columns and arches conforming to heavy timber sizes may be used externally.

**217.3 Type 3B:** Structures of Type 3B (ordinary protected) shall include all exterior masonry wall buildings in which the interior structural elements are wholly or partly of fire-protected wood of not less than two (2) inch nominal thickness, or of other approved protected combustible materials, or of metal protected and insulated to afford the fireresistance rating specified in Table 214.

**217.4 Type 3C:** Structures of Type 3C (ordinary unprotected) construction shall include all exterior masonry wall buildings in which the interior structural members are of wood of not less than two (2) inch nominal thickness or consist of other combustible or noncombustible materials with protection of less than one (1) hour fireresistance rating.

## SECTION 218.0 TYPE 4, FRAME CONSTRUCTION

**218.1 General:** Buildings and structures of frame construction are those in which the exterior walls, bearing walls, partitions, floor and roof construction are constructed wholly or partly of wood stud and joist assemblies with a minimum nominal dimension of two (2) inches, or of other approved combustible materials; with firestopping at all vertical and horizontal draft openings as regulated in Section 875.0, and in which the structural elements have the required fireresistance ratings specified in Table 214. Frame buildings shall be further classified as Types 4A and 4B.

FIRERESISTANCE RATINGS OF STRUCTURAL ELEMENTS (IN HOURS)

Structural element Note a		Type of construction									Section 214.0	
		Type 1 Section 215.0		Type 2 Section 216.0			Type 3 Section 217.0			Type 4 Section 218.0		
		Fireproof		Noncombustible			Exterior masonry walls			Frame		
				Protected		Unprotected	Heavy timbers (mill)	Ordinary		Protected	Unprotected	
								Protected	Unprotected			
1A	1B	2A	2B	2C	3A	3B	3C	4A	4B			
Exterior walls (Section 906.0 and Note b)												
1 Fire separation of less than 5'	Bearing	4	3	2	1	0	2	2	2	1	0	
	Non-bearing	0	0	0	0	0	0	0	0	0	0	
	Bearing	4	3	2	1½	1	2	2	2	1	1 Note d	
	Non-bearing	2	2	1½	1	1	2	2	2	1	1 Note d	
	Bearing	4	3	2	1	0	2	2	2	1	0	
	Non-bearing	2	2	1½	1	0	2	2	2	1	0	
	Bearing	4	3	2	1	0	2	2	2	1	0	
	Non-bearing	1½	1½	1	1	0	See Sec. 217.0	1½	1½	1	0	
2 Fire walls and party walls (Section 907.0)		4	3	2	2	2	2	2	2	2	2	
3 Fire separation assemblies (Note e)		Fire resistance rating corresponding to fire grading of use group—(See Table 902.)										
4 Fire enclosure of exitways, exitway hallways and stairways (Section 909.0 and Note f)		2	2	2	2	2	2	2	2	1	1	
5 Shafts (other than exitways), elevator hoistways (Section 910.0)		2	2	2	2	2	2	2	2	1	1	
6 Exitway access corridors (Note j)		1	1	1	1	1	1	1	1	1	1	
Vertical separation of tenant spaces		1	1	1	1	0	1	1	0	1	0	

**Table 214 (cont'd.)**  
**FIRERESISTANCE RATINGS OF STRUCTURAL ELEMENTS (IN HOURS)**

7	Dwelling unit separations (Note k)		<div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div></div> <div>Note h</div>					1	1	1	1	1
	Other non-bearing partitions		<div><div>0</div><div>0</div><div>0</div><div>0</div><div>0</div></div> <div>Note h</div>					0	0	0	0	0
8	Interior bearing walls, bearing partitions, columns, girders, trusses (other than roof trusses), and framing (Section 911.0 and Note i)	Supporting more than one floor	4	3	2	1	0	See Sec. 217.0	1	0	1	0
		Supporting one floor only	3	2	1½	1	0	See Sec. 217.0	1	0	1	0
		Supporting a roof only	3	2	1½	1	0	See Sec. 217.0	1	0	1	0
9	Structural members supporting wall (Section 911.0)		3	2	1½	1	0	1	1	0	1	0
							Not less than fire-resistance rating of wall supported					
10	Floor construction including beams (Section 912.0 and Note g)		3	2	1½	1	0	See Sec. 217.0	1	0	1	0
		15' or less in height to lowest member	2	1½	1	1	0	See Sec. 217.0	1	0	1	0
11	Roof construction including beams, trusses and framing arches and roof deck (Section 912.0 and Notes g and i)	More than 15' but less than 20' in height to lowest member	1	1	1	0	0	See Sec. 217.0	0	0	1	0
		20' or more in height to lowest member	0	0	0	0	0	See Sec. 217.0	0	0	0	0
			<div><div>0</div><div>0</div><div>0</div><div>0</div><div>0</div></div> <div>Note m</div>									

Note h

**Notes applicable to Table 214**

**Note a.** For special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, the fire resistance rating requirements for structural elements shall be increased accordingly (see Section 400.3).

**Note b.** The fire separation or fire exposure in feet as herein limited applies to the distance measured from the building face to the closest interior lot line, the center line of a street or public space or an imaginary line between two (2) buildings on the same property.

**Note c.** Protected exteriors shall be required within the fire limits in Type 2 construction as follows: high hazard uses, two (2) hour fire resistance with fire separation up to eleven (11) feet.

**Note d.** See Section 303.2.

**Note e.** See Sections 213.0, 909.0 and 912.0.

**Note f.** In all buildings of Types 3 or 4 construction, the stairways and their enclosures may be constructed of wood or other approved materials of similar characteristics and of adequate strength. Exitways may be enclosed in one (1) hour fire resistance rated construction in buildings three (3) stories or less in height.

**Note g.** In Type 3A construction, members which are of material other than heavy timber shall have a fire resistance rating of not less than one (1) hour (see Section 853.2).

**Note h.** Fire-Retardant Treated Wood, complying with Section 903.6.1, may be used as provided in Section 903.6.2.

**Note i.** Where the omission of fire protection from roof trusses, roof framing and decking is permitted, the horizontal or sloping roofs in Type 1 and Type 2 buildings, immediately above such members, shall be constructed of noncombustible materials of the required strength without a specified fire resistance rating, or of mill type construction in buildings not over five (5) stories or sixty-five (65) feet in height (see Section 913.3).

**Note j.** Exitway access corridors serving thirty (30) or less occupants may have a zero (0) fire resistance rating (see Section 610.4).

**Note k.** Separation of all dwelling units shall have a fire resistance rating of not less than one (1) hour.

**Note l.** Interior bearing walls shall meet the requirements of Section 909.0 if serving a fire separation function.

**Note m.** Buildings of H (high hazard), S-1 (moderate hazard storage) or M (mercantile) occupancies when of Type 1 or 2A construction shall have not less than one (1) hour fire resistance rated roof construction (see Section 913.2).

C

D

D

E

F

G

H



# ARTICLE 3

## GENERAL BUILDING LIMITATIONS

### SECTION 300.0 GENERAL

**300.1 Scope:** The provisions of this article shall control the division of [*name of jurisdiction*] into fire limits and the general limitations of height and area of all buildings hereafter erected, and extensions to existing buildings hereafter altered or enlarged as affected by the fire and life hazard incident to type of construction, use group, density of development, exterior exposure and accessibility of buildings and structures to fire-fighting facilities and equipment.

### SECTION 301.0 FIRE LIMITS

**301.1 General:** For the purpose of control of use and construction of buildings to prevent conflagration from fire, the building official shall establish limiting districts designated "fire limits" and "outside fire limits," under the legal procedure of the jurisdiction for creating and establishing fire limits.

**301.2 Fire limits:** The fire limits shall comprise the areas containing congested business, commercial manufacturing and industrial uses or in which such uses are developing. The limits of such areas are described as bounded by [*to be specified*].

**301.3 Outside fire limits:** All other areas not included in the fire limits shall be designated as outside fire limits.

### SECTION 302.0 RESTRICTIONS WITHIN THE FIRE LIMITS

**302.1 General:** All buildings and structures, and all additions to existing buildings and structures, hereafter erected within the boundaries of the fire limits shall be of fireproof (Type 1), protected noncombustible (Types 2A and 2B), heavy timber (Type 3A), or ordinary protected (Type 3B), construction as defined in Article 2 and regulated in Table 214; and shall be constructed within the height and area limitations of Table 305 except as herein provided. Open parking structures may be constructed as permitted under Section 429.0.

**302.2 Type 2C, 3C and 4A construction permitted:** Buildings and structures, and additions to existing buildings and structures, hereafter erected within the fire limits may be of unprotected noncombustible (Type 2C), ordinary unprotected (Type 3C) or protected frame (Type 4A) construction as defined in Article 2 and regulated in Tables 214 and 305 when constructed and located in accordance with the requirements of Table 302.

**Table 302**  
**EXTERIOR WALL FIRERESISTANCE RATING REQUIREMENTS**

Width of fire separation adjacent to exterior wall	Fireresistance rating of exterior wall <sup>1</sup> or barrier	Fireresistance rating of exterior opening protectives	Classification minimum of roof covering
On lot lines or less than 3 ft. therefrom or from any building	4 hour	Not permitted	B
More than 3 ft. but less than 6 ft.	3 hour	3 hour	B
6 ft. or more but less than 11 ft.	2 hour	1½ hour	B
11 ft. or more but less than 30 ft.	1 hour	¾ hour	B
30 ft. or more	0 hour	0 hour	C

**Note 1.** Not less than required by Table 214. The exterior wall or barrier shall extend to the height of the building and be so constructed that it will remain structurally in place for the duration of time indicated by the required fire resistance rating. When the exterior wall or barrier is adjacent to a flat roof, it shall be constructed with a parapet.

**302.3 Storm enclosures:** Storm enclosures may be erected of frame construction not more than ten (10) feet in height and not more than three (3) feet wider than the entrance doors which they serve, provided they do not project more than six (6) feet beyond the building line.

**302.4 Builders' shanties and reviewing stands:** Temporary builders' shanties erected in connection with approved building operations, platforms, reviewing stands, and other similar miscellaneous structures may be erected of frame (Type 4) construction for a limited period of time as approved by the building official.

### **302.5 Bins, tanks, towers and roof structures**

**302.5.1 Timber construction:** Coal and material bins, water towers, tank structures and trestles may be erected of mill type heavy timber construction with dimensions not less than required for Type 3A construction, not over thirty-five (35) feet in height, when located thirty (30) feet from the interior lot lines or any building, except when located on lot lines along a railroad right of way or waterfront.

**302.5.2 Erection on buildings:** Aerial supports not more than twelve (12) feet in height, water tanks and flag poles may be erected of wood on buildings not more than three (3) stories nor more than forty (40) feet in height, and drip bars in cooling towers may be constructed of wood.

**302.6 Motor fuel service stations:** Gasoline service stations, and structures of similar business uses, not including high hazard (H) uses, may be erected of unprotected noncombustible (Type 2C) construction within the height and area limits of use group B of Table 305, provided they are located not less than eleven (11) feet from the lot line or any building.

**302.7 Bus and passenger terminals:** Roofs over parking lots, bus and passenger terminals may be erected one (1) story and not over twenty (20) feet in height and not more than eleven thousand (11,000) square feet in area of noncombustible (Type 2C) construction or of heavy timber mill (Type 3A) construction.

**302.8 Store fronts:** Wood veneers of one (1) inch nominal thickness or exterior grade plywood not less than three-eighths ( $\frac{3}{8}$ ) inch thick may be used on store fronts when facing public streets; provided the veneer does not exceed one (1) story in height and is applied to noncombustible backing or is furred not to exceed one and five-eighths ( $1\frac{5}{8}$ ) inch and fire-stopped in accordance with Sections 875.0 and 912.0. Where all wood veneers comply with Section 903.6.2 for exterior use, the height may be increased to two (2) stories.

### SECTION 303.0 RESTRICTIONS OUTSIDE FIRE LIMITS

**303.1 General:** Outside the fire limits, all types of construction except as herein specifically prohibited, or for which special approval is required in connection with high hazard uses and occupancies in Article 4, shall be permitted within the height and area limitations of Table 305.

**303.2 Lot line separation:** In frame construction, an exterior wall erected less than six (6) feet from its adjacent lot line shall be of one (1) hour fire-resistance rated construction, including opening protectives, except store front and window and door openings in one- and two-family dwellings. Exterior walls of Type 4 frame construction shall not have openings of any type when located three (3) feet or less from interior lot lines.

**303.3 Roof coverings:** Roof coverings shall conform to the fire-resistive requirements for Class A, B, C or non-rated roofings complying with the provisions of Sections 903.0 and 926.0.

### SECTION 304.0 EXISTING BUILDINGS

#### 304.1 Alterations

**304.1.1 Limitations:** These provisions shall not be deemed to prohibit

alterations within the limitations of Section 106.0, provided an unlawful change of use is not involved.

**304.1.2 Minor changes:** Changes, alterations or repairs to the interior of a building and to the front facing a street or other public space may be permitted, provided such changes, in the opinion of the building official, do not increase the size or the fire hazard of the building, or endanger the public safety, and are not specifically prohibited by this code.

**304.1.3 Existing projections:** A change or enlargement shall not be made to an existing part of a building now projecting beyond the street lot line or building line where such is established by law, except in conformity to the provisions of Section 310.0 governing new construction.

**304.2 Increase in height and area:** It shall be unlawful to increase the height or area of an existing building or structure, unless it is of a type of construction permitted for new buildings of the increased height and area, and of a use group within the fire limit in which it is located and as regulated by Table 305.

## **SECTION 305.0 GENERAL AREA AND HEIGHT LIMITATIONS**

**305.1 General:** The areas and heights of all buildings and structures between exterior walls, or between exterior walls and fire walls, shall be governed by the type of construction and the use group classification as defined in Article 2 and shall not exceed the limits fixed in Table 305, except as these may be specifically modified by other provisions of this code.

**305.2 Area limit:** The area limitations specified in Table 305 shall apply to all buildings fronting on a street, or public space not less than thirty (30) feet in width accessible to a public street.

**305.3 Height limit:** The height in feet and number of stories specified in Table 305 shall apply to all buildings and to all separate parts of a building enclosed within lawful fire walls complying with the provisions of Article 9.

**305.4 Multi-story buildings:** Buildings two (2) stories in height may be built to the same area limits provided in Table 305 for one (1) story buildings. In buildings over two (2) stories in height, the area limits of Table 305 for one (1) story buildings shall be reduced as specified in the following Table 305.4.

## **SECTION 306.0 AREA EXCEPTIONS**

**306.1 General:** The provisions of this section shall modify the area limits of Table 305 as herein specified.

**306.2 Street frontage increase:** When a building or structure has more than twenty-five (25) per cent of the building perimeter fronting on a

**Table 305.4**  
**PER CENT REDUCTION OF AREA LIMITS**

No. of stories	Type of construction		
	1A & 1B	2A	2B, 2C, 3A, 3B, 3C, 4A, 4B
1	None	None	None
2	None	None	None
3	None	5%	20%
4	None	10%	20%
5	None	15%	30%
6	None	20%	40%
7	None	25%	50%
8	None	30%	60%
9	None	35%	70%
10	None	40%	80%

street or other unoccupied space not less than thirty (30) feet in width accessible from a street by a posted fire lane not less than eighteen (18) feet in width, the tabular areas may be increased two (2) per cent for each one (1) per cent of such excess frontage.

**306.3 Automatic fire suppression system:** When a building of other than high hazard (use group H) use is equipped with an approved automatic fire suppression system, the tabular areas may be increased by two hundred (200) per cent for one (1) story buildings and one hundred (100) per cent for buildings more than one (1) story in height.

**306.4 School buildings:** When every classroom of a one (1) story school building (use group A-4) has at least one (1) door opening directly to the exterior of the building, the tabular area of Table 305 may be increased two hundred (200) per cent. Not less than one half ( $\frac{1}{2}$ ) of the required exitways from any assembly room included in such buildings shall also open directly to the exterior of the building.

## SECTION 307.0 UNLIMITED AREAS

**307.1 One-story buildings:** In other than frame construction, the area of all buildings of assembly (use group A-3), business (B), factory and industrial (F), mercantile (M) and storage (S) use groups not including high hazard uses, which do not exceed one (1) story or eighty-five (85) feet in height shall not be limited; provided the exitway facilities comply with the provisions of Article 6, an automatic fire suppression system is provided complying with the provisions of Section 1202.0, and the building is isolated as specified in Section 307.2, except that a fire suppression system shall not be required for buildings of Type 2 or Type 3A construction used exclusively for storage of noncombustible material, not packed or crated in combustible material, or as exempted by Section 205.3 for special industrial uses.

Table 305

## HEIGHT AND AREA LIMITATIONS OF BUILDINGS

Height limitations of buildings (shown in upper figure as stories and feet above grade), and area limitations of one- or two-story buildings facing on one street or public space not less than 30 feet wide (shown in lower figure as area in square feet per floor). See Note a.

N.P.—Not permitted

 Unlimited

Table notes appear on Page 89 following

Table notes appear on Page 89 following			Type of construction									
			Type 1		Type 2			Type 3			Type 4	
			Fireproof Note b		Noncombustible			Exterior masonry walls			Frame	
					Protected	Unprotected	(H.T.) Mill	Ordinary joisted		Protected	Unprotected	
								Protected	Unprotected			
Use group		Note a	1A	1B	2A	2B	2C	3A	3B	3C	4A	4B
A-1-A	Assembly, theatres	With stage and scenery		6 St. 75' 14,400	4 St. 50' 11,400	2 St. 30' 7,500	1 St. 20' 4,800	2 St. 30' 7,200	2 St. 30' 6,600	1 St. 20' 4,800	1 St. 20' 5,100	N.P.
		Without stage (motion picture theatres)			5 St. 65' 19,950	3 St. 40' 13,125	2 St. 30' 8,400	3 St. 40' 12,600	3 St. 40' 11,550	2 St. 30' 8,400	1 St. 20' 8,925	1 St. 20' 4,200
A-2	Assembly, night clubs and similar uses			4 St. 50' 7,200	3 St. 40' 5,700	2 St. 30' 3,750	1 St. 20' 2,400	2 St. 30' 3,600	2 St. 30' 3,300	1 St. 20' 2,400	1 St. 20' 2,550	1 St. 20' 1,200
A-3	Lecture halls, recreation centers, terminals, restaurants other than night clubs											
A-4	Assembly, churches, schools											
Note c												
B	Business											
F	Factory and industrial											
H	High hazard											
Note e												
I-1	Institutional, restrained											
I-2	Institutional, incapacitated											
M	Mercantile											
R-1	Residential, hotels											
R-2	Residential, multi-family											
R-3	Residential, 1 & 2 family											
S-1	Storage, moderate											
S-2	Storage, low											
T	Temporary miscellaneous											

**307.1.1 School buildings:** One (1) story school buildings of Type 2, 3A and 3B construction may be unlimited in area when a direct exitway to the outside of the building is provided from each classroom and the building is equipped with an approved automatic fire suppression system throughout. A fire separation shall be provided on all sides of such buildings as specified in Section 307.2.

**307.1.2 Indoor recreation buildings:** Indoor participant sport areas such as tennis courts, skating rinks, swimming pools and equestrian clubs may be unlimited in area and exempt from the automatic fire suppression system requirements, providing:

1. direct exitways to the outside are provided for all the occupants of the recreation area;
2. the recreation area is conspicuously posted as to use and occupancy load;
3. the building is equipped with a manual fire alarm system; and
4. all other areas are equipped with an automatic fire suppression system.

**307.2 Fire separation:** The minimum fire separation on any side of one (1) story buildings of unlimited area shall be determined by the type of construction and fire-resistance rating of the exterior wall adjacent thereto as specified in the following Table 307.

**307.3 Roof vents:** The roof system of one (1) story buildings of unlimited area when of Type 2 or Type 3 construction shall be provided with smoke and heat vents in accordance with Sections 230 and 240 of the Guide for Smoke and Heat Venting listed in Appendix B.

**307.4 Fire access panels:** Grade level doors or fire access panels, as specified in Section 859.4, shall be provided and spaced not more than one hundred fifty (150) feet apart in exterior walls adjacent to a required fire separation less than forty (40) feet.

**Notes applicable to Table 305**

**Note a.** See the following sections for general exceptions to Table 305.

Section 305.4 Allowable area reduction for multi-story buildings.

Section 306.2 Allowable area increase due to street frontage.

Section 306.3 Allowable area increase due to automatic fire suppression system installation.

Section 307.0 Unlimited area one-story buildings.

Section 308.1 Allowable height increase due to automatic fire suppression system installation.

**Note b.** Type 1 buildings permitted unlimited tabular heights and areas are not subject to special requirements that allow increased heights and areas for other types of construction.

**Note c.** The tabular area of one-story school buildings of use group A-4 may be increased two hundred (200) per cent provided every classroom has at least one (1) door opening directly to the exterior of the building. Not less than one-half (1/2) of the required exitways from any assembly room included in such buildings shall also open directly to the exterior of the building.

**Note d.** Church auditoriums of Type 3A construction may be erected to sixty-five (65) feet in height, and of Type 4 construction to forty-five (45) feet in height.

**Note e.** For exceptions to height and area limitations of high hazard use buildings, see Article 4 governing the specific use. For other special fire-resistive requirements governing specific uses, see Section 905.0.

**Note f.** For exceptions to height of multi-family dwellings of Types 2B and 3B construction, see Section 905.6.

**Note g.** For height and area exceptions covering open parking structures, see Section 429.0.

**Note h.** For height and area exceptions covering petroleum bulk-storage buildings, see Section 905.3.

**Table 307**  
**MINIMUM FIRE SEPARATION FOR TYPE OF CONSTRUCTION**

Type of construction	Fire-resistance rating of exterior bearing walls	Minimum fire separation***	Fire-resistance rating of bearing & non-bearing portions of exterior walls	Minimum fire separation
2A	2 hr.	30 ft.	—	—
2B	1 hr.	40 ft.	2 hr.*	30 ft.
2C	0 hr.	50 ft.	3 hr.**	30 ft.
3A	2 hr.	40 ft.	3 hr.**	30 ft.
3B	2 hr.	40 ft.	3 hr.**	30 ft.
3C	2 hr.	50 ft.	4 hr.**	30 ft.

\*All exterior wall openings shall be protected with one and one-half hour fire-resistance rated approved opening protectives.

\*\*All exterior wall openings shall be protected with three hour fire-resistance rated approved opening protectives.

\*\*\*When the fire separation exceeds the herein specified minimum, the requirements of Table 214, Row 1 (Exterior walls with fire separation of 30 ft. or more: bearing) shall apply.

### SECTION 308.0 HEIGHT EXCEPTIONS

**308.1 Automatic fire suppression systems:** When a building of other than high hazard (use group H) use is equipped with an approved automatic fire suppression system, the building may be erected one (1) story or twenty (20) feet higher than specified in Table 305.

**308.2 Auditoriums:** Auditoriums (use group A-4) of protected or heavy timber (Type 3A) construction may be erected to sixty-five (65) feet in height and of unprotected construction to forty-five (45) feet.

### SECTION 309.0 STREET ENCROACHMENTS

**309.1 General:** Except as herein provided, a part of any building hereafter erected and additions to an existing building heretofore erected shall not project beyond the lot lines or beyond the building line when such line is established by the zoning law or any other statute controlling building construction.

**309.2 Below grade:** A part of a building hereafter erected below grade that is necessary for structural support of the building shall not project beyond the lot lines, except that the footings of street walls or their supports located at least eight (8) feet below grade may project not more than twelve (12) inches beyond the street lot line.

**309.3 Above grade:** All projections hereafter permitted beyond the street lot line or the building line above grade shall be so constructed as to be readily removable without endangering the safety of the building.

**309.4 Projections necessary for safety:** In any specific application, the building official may designate by approved rules such architectural



features and accessories which are deemed desirable or necessary for the health or safety of the public and the extent to which they may project beyond the street lot line or the building line where such is established by statute, subject to all provisions and restrictions that may be otherwise prescribed by law, ordinance or rule of the authorities having jurisdiction over streets or public spaces.

**309.5 Permit revocable:** Any permit granted or permission expressed or implied in the provisions of this code to construct a building so as to project beyond the street lot line or building line shall be revocable by the jurisdiction at will.

**309.6 Existing encroachments:** Parts of existing buildings and structures which already project beyond the street lot line or building line may be maintained as constructed until their removal is directed by the proper authorities of the jurisdiction.

### SECTION 310.0 PERMISSIBLE STREET PROJECTIONS

**310.1 General:** Subject to such provisions as may be otherwise prescribed by law or ordinance, or by rule of the municipal authorities having jurisdiction over streets, highways, and public spaces, the following projections, as described in Sections 310.2 through 310.11.1, shall be permitted beyond the street lot line or the building line, as the case may be.

**310.2 Cornices and eaves:** Main cornices or roof eaves located at least twelve (12) feet above the curb level shall project not more than three (3) feet.

**310.3 Architectural decorations:** Belt courses, lintels, sills, architraves, pediments and similar architectural decorations shall project not more than four (4) inches when less than ten (10) feet above the curb level, and not more than ten (10) inches when ten (10) feet or more above the curb level.

**310.4 Ornamental columns:** Ornamental columns, or pilasters, including the bases and moldings which emphasize the main entrance of the building, shall project not more than twelve (12) inches.

**310.5 Entrance steps:** Entrance steps and doors shall project not more than twelve (12) inches and shall be guarded by check pieces not less than three (3) feet high, or shall be located between ornamental columns or pilasters.

**310.6 Oriel windows:** Oriel windows with the lowest portion at least ten (10) feet above the curb level shall project not more than two and one-half (2½) feet.

**310.7 Balconies:** Balconies located at least ten (10) feet above the curb level shall project not more than three (3) feet, except that when the balcony is required in connection with a fire escape or exterior stairway

as an element of a means of egress, the projection may be increased, but not to exceed four (4) feet.

**310.8 Awnings:** Retractable or fixed awnings shall have clearances above the grade, and shall be installed in accordance with the requirements of Section 313.0.

**310.9 Awning covers or boxes:** Awning covers or boxes located at least eight (8) feet above the curb level shall project not more than three (3) feet.

**310.10 Marquees:** For the purpose of this section, a marquee shall include any object or decoration attached to or a part of said marquee.

**310.10.1 Projection and clearance:** The horizontal clearance between a marquee and the curb line shall be not less than two (2) feet. A marquee projecting more than two-thirds ( $\frac{2}{3}$ ) of the distance from the property line to the curb line shall be not less than ten (10) feet above the ground or pavement below.

**310.10.2 Thickness:** The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not exceed three (3) feet when the marquee projects more than two-thirds ( $\frac{2}{3}$ ) of the distance from the property line to the curb line, and shall not exceed nine (9) feet when the marquee is less than two-thirds ( $\frac{2}{3}$ ) of the distance from the property line to the curb line.

**310.10.3 Roof construction:** The roof or any part thereof may be a skylight of approved plastics, or wired glass not less than one-fourth ( $\frac{1}{4}$ ) inch thick with a single pane not more than eighteen (18) inches wide. Every roof and skylight of a marquee shall be sloped to downspouts which shall conduct any drainage from the marquee in a manner not to spill over the sidewalk.

**310.10.4 Location prohibited:** Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and not to obstruct the clear passage of stairways or exitway discharge from the building or the installation or maintenance of street lighting.

**310.10.5 Construction:** A marquee shall be supported entirely from the building and constructed of noncombustible material. Marquees shall be designed and constructed to withstand wind or other lateral loads and live loads as required in Article 7 of this code. Structural members shall be protected to prevent deterioration as required by Article 8.

**310.11 Vaults:** Vaults below the sidewalk level shall extend not closer than three (3) feet to the curb line; and the construction and use of such vaults shall be subject to the terms and conditions of the authority or legislative body having jurisdiction.

**310.11.1 Areaways:** Areaways shall not project beyond the street lot line more than four (4) feet; provided that every such areaway shall be

covered over at the street grade by an approved grating of metal or other noncombustible material.

### **SECTION 311.0 PERMISSIBLE YARD AND COURT ENCROACHMENTS**

**311.1 General:** A part of any building or structure shall not extend into side courts, inner courts or yards required for light and ventilation of habitable and occupiable rooms by the provisions of Article 5, or of the zoning law or other statutes controlling building construction, except as hereinafter provided; but the encroachment shall not exceed twenty (20) per cent of the legal area of yard or court required for light and ventilation purposes.

**311.2 Roof eaves:** Roof eaves shall project not more than three (3) feet beyond the face of the wall.

**311.3 Steps and architectural features:** Steps, window sills, belt courses and similar architectural features, rain leaders and chimneys shall project not more than two (2) feet beyond the face of the wall.

**311.4 Exterior stairways and fire escapes:** Outside stairways, smoke-proof tower balconies, fire escapes or other required elements of a means of egress shall not project more than four (4) feet beyond the face of the wall.

### **SECTION 312.0 SPECIAL AND TEMPORARY PROJECTIONS**

**312.1 Alley projections:** The permissible projection beyond street lot lines shall apply in general to building projections into alleyways, except as may be modified by the local administrative authority having jurisdiction or by special deed restriction.

**312.2 Special permits:** When authorized by special permit, vestibules and storm doors may be erected for periods of time not exceeding seven (7) months in any one (1) year, and shall project not more than three (3) feet nor more than one-fourth ( $\frac{1}{4}$ ) the width of the sidewalk beyond the street lot line. Temporary entrance awnings may be erected with a minimum clearance of seven (7) feet to the lowest portion of the hood or awning when supported on removable steel or other approved non-combustible supports.

### **SECTION 313.0 AWNINGS AND CANOPIES**

**313.1 Permit:** A permit shall be obtained from the building official for the erection, repair or replacement of any fixed awning, canopy or hood except as provided in Section 313.1.1, and for any retractable awning located at the first story level and extending over the public street or over any portion of a court or yard beside a building serving as a passage from a required exitway or exitway discharge to a public street.

**313.1.1 Exemption from permit:** A permit shall not be required for the erection, repair or replacement of fixed or retractable awnings installed on one- and two-family dwellings, unless they project over public property, or for retractable awnings installed above the first story or where the awning does not project over the public street or over any court or yard serving as a passage from a required exitway to a public street.

### **313.2 Installation of awnings**

**313.2.1 Retractable awnings:** There shall be a minimum clearance of seven (7) feet from the sidewalk to the lowest part of the framework or any fixed portion of any retractable awning, except that the bottom of the valance of canvas awnings may extend to six (6) feet nine (9) inches above the sidewalk. Retractable awnings shall be securely fastened to the building and shall not extend closer than twelve (12) inches from the curb line. They shall be equipped with a mechanism or device for raising and holding the awning in a retracted or closed position against the face of the building.

**313.2.2 Fixed or permanent awnings:** The clearance from the sidewalk to the lowest part of any fixed or permanent awning shall be the same as required in Section 313.2.1 for retractable awnings. Fixed or permanent awnings installed above the first story shall not project more than four (4) feet.

**313.3 Canopies:** Canopies shall be constructed of a metal framework, with an approved covering, attached to the building at the inner end and supported at the outer end by not more than two (2) stanchions with braces anchored in an approved manner and placed not less than two (2) feet in from the curb line. The horizontal portion of the framework shall be not less than eight (8) feet nor more than twelve (12) feet above the sidewalk and the clearance between the covering or valance and the sidewalk shall be not less than seven (7) feet. The width of canopies shall not exceed eight (8) feet.

**313.4 Special applications of awnings:** Rigid awnings supported in whole or part by members resting on the ground and used for patio covers, car ports, summer houses or other similar uses shall comply with the requirements of Section 313.5 for design and structure. Such structures shall be braced as required to provide rigidity.

**313.5 Design and construction:** Fixed awnings, canopies and similar structures shall be designed and constructed to withstand wind or other lateral loads and live loads as required by Article 7 of this code with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration.

**SECTION 314.0 TEMPORARY STRUCTURES**

**314.1 General:** Pursuant to a variance granted by the board of appeals under the provisions of Section 126.0, the building official may issue a permit for temporary construction as approved by the board of appeals. Such permits shall be limited as to time of service, but such temporary construction shall not be permitted for more than one (1) year.

**314.2 Special approval:** All temporary construction shall conform to structural strength, fire safety, means of egress, light, ventilation and sanitary requirements of this code necessary to insure the public health, safety and general welfare.

**314.3 Termination of approval:** The building official is hereby authorized to terminate such special approval and to order the demolition of any such construction at his discretion, or as directed by the decision of the board of appeals.

**SECTION 315.0 PHYSICALLY HANDICAPPED AND AGED**

**315.1 Applicability:** The provisions of this section shall apply to all levels and areas used by the general public, employees, persons visiting or on the premises for any reason and shall apply to all use groups except R-3, R-4 and T.

**315.1.1 Modifications:** Where it can be demonstrated that one (1) or more of the following provisions is not applicable to the proposed use and occupancy, modifications may be sought under the provisions of Section 109.0.

**315.2 Special requirements**

**315.2.1 Residential (R-1) use:** At least one (1) bedroom unit for every twenty-five (25) bedroom units or fraction thereof in use group (R-1) (residential, hotels) buildings shall be made accessible to physically handicapped persons. The bedroom units allocated for the physically handicapped shall be proportionately distributed throughout all types of units. Access to additional floors without public facilities is not required.

**315.2.2 Residential (R-2) use:** At least one (1) dwelling unit for every twenty-five (25) dwelling units or fraction thereof in use group R-2 (residential, multi-family) buildings shall be made accessible to physically handicapped persons. The dwelling units allocated for the physically handicapped shall be proportionately distributed throughout all types of units. Laundry and storage facilities shall be accessible from the barrier free units. Access to additional floors without public facilities is not required.

**315.3 Building entrance:** At least one (1) primary entrance at each grade floor level of a building or structure shall be accessible from the parking lot or the nearest street by means of a walk uninterrupted by

steps or abrupt changes in grade and shall have a width of not less than five (5) feet and a gradient of not more than one (1) foot in twenty (20) feet or a ramp meeting the requirements of Section 615.0, except for enclosure. This entrance shall comply with requirements of Section 612.0.

**315.4 Parking lots and building approaches:** A parking lot servicing each entrance described in Section 315.3 shall have a number of level parking spaces as set forth in the following Table 315.4, identified by above grade signs as reserved for physically handicapped persons. Each reserved parking space shall be not less than twelve (12) feet wide.

**Table 315.4**  
**ACCESSIBLE PARKING SPACES**

Total parking in lot	Required number of accessible spaces
up to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of total
over 1000	20 plus 1 for each 100 over 1000

**315.4.1 Parking spaces:** Parking spaces for the physically handicapped shall be located as close as possible to elevators, ramps, walkways, and entrances. Parking spaces should be located so that the physically handicapped persons are not compelled to wheel or walk behind parked cars to reach entrances, ramps, walkways and elevators.

**315.4.2 Curbs:** Where a curb exists between a parking lot surface and a sidewalk surface, an inclined curb approach or a curb cut with a gradient of not more than one (1) foot in twelve (12) feet and a width of not less than four (4) feet shall be provided for wheelchair access.

**315.5 Interior access:** Interior means of access to all floor levels required to be accessible for the physically handicapped shall be provided by ramps meeting the requirements of Section 615.0 or elevators, and access to all points on each floor level shall be provided by means of passageways, corridors, and doorways meeting the requirements of Sections 610.0, 612.0 and 625.0.

**315.6 Electrical switches, controls, and fire alarms:** Light switches, controls, fire alarms, etc., shall be located not more than four (4) feet above the floor.

**315.6.1 Telephones:** Where a public or pay phone is installed, five (5)

per cent or not less than one (1) telephone shall be accessible to, and usable by, physically handicapped persons. Such telephones shall have the dial, coin slot, and handset not more than fifty-four (54) inches above the floor.

**315.7 Elevator requirements:** If interior access in multi-story buildings is provided by elevator(s), at least one (1) elevator shall meet the following requirements listed below.

1. The elevator cab shall have a clear area of not less than twenty-five (25) square feet with a minimum dimension of fifty-six (56) inches.
2. The elevator door shall have a minimum clear opening width of thirty-two (32) inches.
3. The floor and control buttons shall be located not more than sixty (60) inches above the floor.
4. Braille plates shall be provided adjacent to all cab control buttons and switches.
5. Braille plates shall be provided for floor designation on each floor, sixty (60) inches above the floor, on the fixed point at the open side of the elevator door.

### **315.8 Access to plumbing fixtures**

**315.8.1 Toilet rooms:** At least one (1) toilet room and one (1) fixture within such room shall be accessible to and usable by, physically handicapped persons. A toilet room shall have a clear space beyond the room door swing of not less than sixty (60) inches by sixty (60) inches.

**315.8.2 Water closet stall:** The clear width between the face of a water closet stall and a wall shall be not less than forty-eight (48) inches. A water closet stall shall be not less than forty-two (42) inches wide, seventy-two (72) inches deep, and have an out-swinging door at least thirty-two (32) inches wide or an opening at least thirty-two (32) inches wide. Handrails shall be provided on both sides of the water closet that are not less than forty-two (42) inches long and mounted thirty-three (33) inches above and parallel to the floor, with the front end positioned twenty-four (24) inches in front of the water closet. Handrails for children shall be twenty-eight (28) inches above the floor.

**315.8.3 Water closet:** A water closet shall have a seat seventeen (17) inches from the floor, [fifteen (15) inches for children], and have a narrow understructure that recedes sharply from the front. The trap shall not extend in front of, or be flush with, the lip of the bowl. Where only one (1) water closet is required in the facility, a standard height model may be used.

**315.8.4 Urinal:** Toilet rooms for men shall have a wall mounted urinal with the opening of the basin nineteen (19) inches from the floor, or shall have floor-mounted urinals that are level with the main floor of the toilet room.



**315.8.5 Drinking fountain:** Where a drinking fountain is required, five (5) per cent or not less than one (1) drinking fountain or other water dispensing means shall be accessible to, and usable by physically handicapped persons. A floor type, wall-mounted, or semi-recessed (fully-recessed not acceptable) drinking fountain or cooler shall have a spout and hand control near the front of the unit with the basin located not more than thirty (30) inches above the floor, and shall also be operated by means of a foot pedal.

**315.8.6 Miscellaneous:** A shelf, disposal unit, or the lower edge of a mirror shall not be more than forty (40) inches above the floor. A towel and/or sanitary napkin dispenser (paper level) or electric hand dryer shall not be more than forty-eight (48) inches above the floor.

**315.9 Assembly seating accommodations:** Places of assembly with fixed seating arrangements shall provide viewing positions for persons in wheelchairs in accordance with the following Table 315.9.

**Table 316.9**  
**PLACES OF ASSEMBLY, ACCESSIBLE VIEWING POSITIONS**

Capacity of assembly space	Number of viewing positions
up to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of total
over 1000	20 plus 1 for each 100 over 1000

**315.9.1 Location:** Viewing positions for wheelchair persons shall be provided in a reasonable and convenient section or sections of the facility by providing clear space devoid of any fixed seating arrangements. These positions shall be located so as not to interfere with egress from any row of seats, shall be reached by means of ramps and/or elevators, and shall not infringe upon aisle requirements.

**315.9.2 Access:** There shall not be steps in the aisles or in the access route used by the physically handicapped to reach the performance viewing positions, but the aisles may be inclined according to the provisions of Section 615.0.

**315.10 Checkout lanes:** Buildings which include checkout lanes shall provide at least one (1) checkout lane, on each floor where such lanes are used, which is not less than thirty-six (36) inches wide.



**315.11 Turnstiles:** Buildings which utilize turnstiles to control traffic shall provide a clearly marked alternate route for the physically handicapped which is at least thirty-six (36) inches wide.

#### **SECTION 316.0 SPECIAL HISTORIC BUILDINGS AND DISTRICTS**

**316.1 Approval:** The provisions of this code relating to the construction, repair, alteration, enlargement, restoration and moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state and/or local government authority as historic buildings, subject to the approval of the board of appeals when such buildings are judged by the building official to be safe and in the public's interest of health, safety and welfare regarding any proposed construction, alteration, repair, enlargement, relocation, and location within the fire limits. All such approvals must be based on the applicant's complete submission of professional architectural and engineering plans and specifications bearing the professional seal of the designer.



# ARTICLE 4

## SPECIAL USE AND OCCUPANCY REQUIREMENTS

### SECTION 400.0 GENERAL

**400.1 Scope:** In addition to the general requirements of this code governing the location, construction and equipment of all buildings and structures and the fire-resistance ratings, height and area limitations of Tables 214 and 305, the provisions of this article shall control all buildings and structures designed for high hazard uses and occupancies which involve extreme fire, smoke, explosion or toxic gas risks, and places of assembly in which people congregate in large numbers and which are susceptible to panic incidental to crowds. Except as herein specifically provided, the applicable standards listed in Appendix B shall be deemed to comply with the requirements of this article.

Chemical plants, packing plants, grain elevators, refineries, flour mills and other special structures may be constructed in accordance with the recognized practices and requirements of the specific industry. The building official may permit such variations from the requirements of this code which will secure reasonable and economical construction with the necessary fire, life and property safeguards. In granting such variations, due regard shall be given to the isolation of the structure and fire hazard from and to surrounding property.

**400.2 Uses involving explosion hazards:** The provisions of this article shall apply to all uses involving the storage, manufacture, handling or filling of flammable and volatile solids, liquids or gases which generate combustible and explosive air-vapor mixtures and toxic gases including nitrocellulose film; pyroxylin plastics; grain and other combustible dusts and pulverized fuels; combustible fibers; pyroxylin lacquer-spraying operations; liquified petroleum gases; alcohol, ether and gasoline; flammable dusts and residues resulting from fabrication, grinding and buffing operations, and all other explosion hazard risks.

**400.3 Special high hazards:** When necessary to resist a higher degree of fire severity than specified herein, for high concentrations of combustible contents and for buildings of high hazard uses which exceed five (5) stories or sixty-five (65) feet in height, the building official

may require higher fire resistance ratings than the requirements of Table 214 governing the fire resistance ratings of types of construction and protection of structural elements.

**400.4 Means of egress:** The means of egress for buildings of hazardous uses and occupancies shall conform to the requirements of Article 6, except as may be modified by more restrictive provisions of this article for specific uses.

**400.5 Heating and venting:** The requirements herein prescribed for the installation of heating and venting appliances and equipment for high hazard uses and occupancies shall be construed as supplemental to the provisions of Articles 5 and 10, and the mechanical code listed in Appendix B.

**400.6 Equipment rooms:** Heating and ventilating equipment in occupancies involving fire hazards from flammable vapors, dust, combustible fibers or other highly combustible substances shall be installed and protected against fire and explosion hazards in accordance with the mechanical code listed in Appendix B. Rooms containing such equipment shall be segregated by construction of not less than two (2) hour fire resistance rating except as may be required for specific uses, without openings in the enclosure walls and with means of direct ingress and egress from the exterior, or such equipment shall be located in accessory structures segregated from the main building.

**400.7 Fire-fighting and extinguishing equipment:** All buildings designed for specific hazardous uses shall be protected with approved automatic fire suppression systems or such other fire-extinguishing and auxiliary equipment as herein provided and in accordance with the requirements of Article 12.

**400.8 Segregation of storage spaces:** All rooms and spaces used for the storage of volatile and flammable materials shall be separately enclosed and segregated with fire resistance rated construction as herein required for specific uses and occupancies.

**400.9 Restricted locations:** Except as otherwise specifically approved, high hazard uses shall not be located in the fire limits nor in a building of unprotected frame (Type 4B) construction, nor in any case within two hundred (200) feet of the nearest wall of a building classified in a public assembly or institutional use group.

## SECTION 401.0 EXPLOSION HAZARDS

**401.1 Explosion relief:** Every structure, room or space occupied for uses involving explosion hazards shall be equipped and vented with explosion relief systems and devices arranged for automatic release under predetermined increase in pressure as herein provided for specific uses or in accordance with accepted engineering standards and practice.

**401.2 Venting devices:** Venting devices to relieve the pressure resulting from explosive air-vapor mixtures shall consist of windows, skylights, vent flues or releasing roof or wall panels which discharge directly to the open air or to a public place or other unoccupied space not less than twenty (20) feet in width on the same lot. Such releasing devices shall be so located that the discharge end shall be not less than ten (10) feet vertically and twenty (20) feet horizontally from window openings or means of egress facilities in the same or adjoining buildings or structures. The exhaust shall always be in the direction of least exposure and never into the interior of the building.

**401.3 Area of vents:** The aggregate clear vent relief area shall be regulated by the type of construction of the building and shall be not less than prescribed below:

1. heavy reinforced concrete frame, one (1) square foot for eighty (80) cubic feet of volume;
2. light structural steel frame and ordinary construction, one (1) square foot for sixty-five (65) cubic feet of volume; and
3. light wood frame construction, one (1) square foot for fifty (50) cubic feet of volume.

The combined area of open windows pivoted sash or wall panels arranged to open under internal pressure shall not be less than ten (10) per cent of the area of the enclosure walls, with not less than fifty (50) per cent of the opening arranged for automatic release.

**401.4 Construction of vents:** All explosion relief devices shall be of an approved type constructed of light weight, noncombustible and corrosion-resistive materials, and the discharge end shall be protected with approved screens of not more than three-quarter ( $\frac{3}{4}$ ) inch mesh, arranged to blow out under relatively low pressures.

## SECTION 402.0 VOLATILE FLAMMABLES

### 402.1 Process storage

**402.1.1 Inside storage:** Unless otherwise approved by the fire official, inside storage in process rooms shall be limited to one (1) day's supply in approved sealed containers of not more than five (5) gallon capacity or in approved steel barrels or drums of not more than fifty-five (55) gallon capacity.

**402.1.2 Handling:** Discharge or filling operations shall be by pump through an approved system of securely attached and continuous piping or hose lines. In processes requiring the use of open vats or mixing tanks, an approved mechanical ventilating system shall be provided to remove the vapors or to produce a vapor mixture of not more than one (1) per cent concentration.

**402.1.3 Construction of enclosures:** Process rooms shall be separated from other uses and occupancies by walls, floors and ceilings of not less than two (2) hours fire resistance rating with one and one-half (1½) hour fire doors or the approved labeled equivalent complying with Article 9. The interior door openings shall be provided with non-combustible sills not less than six (6) inches high and the room shall be vented as required in Section 401.1. Floors shall be waterproofed and drained to comply with Section 872.0.

**402.1.4 Fire protection:** First aid fire appliances and automatic fire suppression systems or other extinguishing equipment shall be provided in accordance with Article 12 and the standards listed in Appendix I. Provision shall be made to prevent leaking flammable vapors from being exposed to open flames, fire or sparks.

**402.2 Main storage:** Main storage systems of volatile flammable liquids shall be constructed and installed in accordance with the applicable standards listed in Appendix B. Such storage may be either outside underground, outside aboveground, inside underground, or outside storage house. Aboveground bulk storage tank shall not be located less than three hundred (300) feet from any building of assembly (use group A) or institutional (use group I) uses.

**402.2.1 Outside underground system:** Outside tanks shall be buried underground below the basement level of adjacent buildings, with the top of the tanks not less than two (2) feet below grade or with a reinforced concrete or other approved structural cover not less than four (4) inches thick and a twelve (12) inch earth cover. The maximum capacity of such tanks shall be limited by their location in respect to adjacent buildings which are not an essential part of the installation and adjacent lot lines as provided in Table 402.2.1.

When within ten (10) feet of any building not an essential part of the installation, and the top of the tank is above the lowest floor of the building, the capacity of the tank shall be not more than five hundred and fifty (550) gallons.

The capacity of storage of combustible liquids other than volatile

Table 402.2.1

**CAPACITY OF OUTSIDE UNDERGROUND TANKS FOR VOLATILE FLAMMABLE LIQUIDS**

Fire separation in feet	Quantity of storage in gallons
50.....	Unlimited
40.....	50,000
30.....	20,000
25.....	12,000
20.....	6,000
10.....	3,000

flammable as herein defined shall be restricted to five (5) times the values specified in Table 402.2.1.

**402.2.2 Outside aboveground system:** Aboveground tanks shall be located only outside the fire limits and the capacity, location, construction and exposures shall be in accordance with the applicable standards listed in Appendix B.

**402.2.3 Inside underground system:** Inside underground tanks shall be located not less than two (2) feet below the level of the lowest floor of the building in which located or any other building within a radius of ten (10) feet of the tank. Such tanks shall not be located under the sidewalk or beyond the building line. It shall be unlawful to cover any tanks from sight until after inspection and test and written approval of the building official. The maximum limit of individual tank capacity shall be not more than five hundred and fifty (550) gallons and the entire system shall be subject to special approval of the building and fire officials.

**402.2.4 Outside storage house:** All outside storage houses shall be constructed of noncombustible (Type 2) construction or better. Openings shall not be permitted in the enclosure walls within eleven (11) feet of adjoining property lines or with a fire exposure of less than eleven (11) feet from any building or structure not part of the installation.

**402.2.5 Special restrictions:** The building official may require greater fire separations or he may limit storage capacities under severe exposure hazard conditions when necessary for public safety.

## SECTION 403.0 FIRE PREVENTION CODE

**403.1 Inspections:** All buildings and structures involving the use and handling of flammable or explosive materials, places of assembly and other hazardous uses and occupancies shall be inspected in accordance with the fire prevention code listed in Appendix B. Such inspection shall be made to insure compliance with the provisions of the fire prevention code in respect to protection against fire and panic; maintenance of exitways and operation of fire door assemblies; fire protection systems; standpipes; hydrant and fire suppression systems; fire-alarm, signaling and central station alarm systems; conduct of fire drills and fire brigades; and all special fire extinguishing equipment.

**403.2 Housekeeping:** Periodic inspections of existing uses and occupancies shall be made to insure maintenance of good housekeeping conditions including the removal of waste and rubbish; safe arrangement and storage of merchandise and other contents; proper segregation of hazardous processes; handling of volatile flammables; avoidance of dangerous congestion and maintenance of all means of egress clear of obstructions; and the safe operation of all places of public assembly in which com-

bustible scenery and hazardous equipment are in use while open to the public.

**403.3 Coordination of inspections:** The building, fire, and health officials and other administrative agencies of the jurisdiction to whom the authority is delegated to inspect buildings and structures in respect to the maintenance of safe conditions of use and occupancy shall immediately notify the respective official of any violation of the provisions of this code or the fire prevention and health rules and regulations.

#### **SECTION 404.0 SPECIAL PERMITS AND CERTIFICATES OF FITNESS**

**404.1 Special permits:** A hazardous or dangerous industry, trade, occupation or use which involves the transportation, storage or handling of explosive, flammable, combustible or other substance involving fire or life hazards shall not be conducted without a permit from the fire official prescribing the conditions and requirements necessary to secure the public safety.

**404.2 Certificate of fitness:** Before any equipment involving fire or life hazard is placed in operation, the supervisor or operator shall secure a certificate of fitness from the administrative official certifying to the qualifications of the person to whom such certificate is issued. Certificates of fitness shall be required for the operation of boilers and unfired pressure vessels as specified in the mechanical code listed in Appendix B, and for the conduct of all high hazard uses involving the storage, use or handling of flammable volatile liquids, materials and mixtures, liquified gases and compressed gases under a pressure of more than fifteen (15) pounds per square inch (psi), and all acid and liquid chemicals of a combustible and explosive character. All certificates of fitness may be terminated for cause at any time, and shall be renewed at intervals of not more than one (1) year.

#### **SECTION 405.0 EXISTING BUILDINGS**

**405.1 Special permit for existing uses:** Any existing hazardous use which was heretofore authorized by a permit issued under the provisions of law or the regulations of the fire official may be continued by special permit provided the continuance of such use or occupancy does not endanger the public safety.

**405.2 Existing use prohibited:** An existing building of frame (Type 4) construction which is more than two (2) stories in height or more than five thousand (5,000) square feet in area; or of nonfireproof (Type 3) construction which is more than four (4) stories in height shall not be continued in use or hereafter occupied for the manufacture of pyroxylin plastics or similar materials of high fire hazard and explosive characteristics.



### 405.3 Places of assembly

**405.3.1 Change of use:** An existing building or structure or part thereof shall not be altered or converted into a place of assembly unless it complies with all provisions of this code applicable to places of public assembly hereafter erected.

**405.3.2 Existing use altered:** When an existing building or structure heretofore used as a place of public assembly is altered and the cost of such alteration is more than fifty (50) per cent of the physical value of the building as defined in Section 106.8, all provisions of this code relating to new places of public assembly shall be complied with. When the cost of such alteration is less than fifty (50) per cent of the physical value of the building, such alterations shall comply as nearly as is practicable with the provisions of this code which govern the arrangement and construction of seats, aisles, passageways, stage and appurtenant rooms, fire-fighting and extinguishing equipment and the adequacy of means of egress.

**405.3.3 Increase in occupancy load:** Whenever the occupancy load of an existing place of public assembly is increased beyond the approved capacity of its exitways, the building or part thereof shall be made to comply with the requirements for a new building hereafter erected for such public assembly use.

### 405.4 Swimming pools

**405.4.1 Change of use:** An existing pool used for swimming or bathing or accessory equipment or part thereof shall not be altered or converted for any other use unless it complies with all provisions of this code applicable to the use intended.

**405.4.2 Continuation of existing use:** Existing swimming pools may be continued without change, provided the safety requirements of Section 428.8 are observed where required by the building official.

## SECTION 406.0 LIQUIFIED PETROLEUM GASES

**406.1 General:** The provisions of this section shall apply to the design, construction, location, installation and operation of propane, butane and other petroleum gas facilities, normally stored in the liquid state under pressure for use in all buildings and structures. Refineries, tank farms and utility gas plants shall be subject to special approvals in accordance with accepted engineering practice as defined in Appendix B.

**406.2 Classification of systems:** Systems for the storage and use of liquified petroleum gases shall be classified as: cylinder or bottled gas systems; aboveground tank systems other than bottled gas; and underground tank systems.

**406.3 Bottled gas:** A container or cylinder of bottled gas for domestic or commercial use shall not exceed twelve hundred (1200) gallon equivalent water capacity; and such container shall be tested and approved by an accredited testing authority and shall be identified in accordance with the Department of Transportation (DOT) regulations. The cylinders shall be installed above ground, with valves, flexible connectors, piping and safety devices in accordance with the approved rules; except that such containers, when approved by the building official, may be installed for use inside buildings for industrial purposes or in connection with construction, repair, or alteration operations.

**406.4 Aboveground tank systems other than bottled gas:** All aboveground tank systems other than cylinder or bottled gas shall be located with respect to lot lines and adjacent buildings on the same lot as specified in Table 406. The tanks shall be constructed and tested in accordance with the regulations of the mechanical code listed in Appendix B for unfired pressure vessels; and the installation, valves, accessories, piping, vaporizers and safety devices shall be in accordance with accepted engineering practice. Bulk storage shall not be permitted within the fire limits.

**406.4.1 Special restrictions:** The building official may require greater fire separations or greater limitations of storage capacities when necessary for public safety.

**406.5 Underground tank systems:** Underground tank systems shall be buried at least two (2) feet below grade. When required, such tanks shall be anchored or weighted to prevent floating. All containers shall be given an approved protective coating of hot dip galvanizing, red lead and asphalt, or other approved corrosion-resistive protection. The fire separation from lot lines and other buildings on the same lot shall comply with Table 406.

Table 406  
SEPARATION FOR TANK CONTAINER SYSTEMS

Water capacity per container (in gallons)	Minimum distance (in feet)		
	Containers		Between aboveground containers
	Underground	Aboveground	
Less than 125 (Note a)	10	None (Note b)	None
125 to 250	10	10	None
251 to 500	10	10	3
501 to 2,000	25 (Note c)	25 (Note c)	3
2,001 to 30,000	50	50	5
30,001 to 70,000	50	75	} $\frac{1}{4}$ of sum of diameters of adjacent containers
70,001 to 90,000	50	100	
90,001 to 120,000	50	125	

**406.6 Labeling:** All inlet and outlet connections except safety relief valves, level and pressure gauges shall be labeled to designate whether they communicate with vapor or liquid space and the tanks shall be marked with a securely attached label and nameplate identifying the system, working pressure, vapor pressure of the contents and permissible liquid level in accordance with accepted engineering practice.

**406.7 Instructions:** Complete installation, operation and maintenance instructions shall be supplied for the personnel responsible for the use of the system.

**406.8 Grounding:** All aboveground tanks exceeding twelve hundred (1200) gallons equivalent water capacity shall be permanently and effectively grounded.

## SECTION 407.0 PYROXYLIN PLASTICS

**407.1 General:** The provisions of this section shall regulate all buildings, structures and parts thereof used for the storage, handling or fabrication of pyroxylin plastic whether in raw material, process, finished product or scrap.

**407.2 Exceptions:** The provisions of this section shall not apply to the manufacture, use or storage of nitro-cellulose film or the incidental storage of articles manufactured from pyroxylin plastics offered for sale in mercantile buildings (see Section 208.0).

**407.3 Restrictions:** A permit for the storage or manufacture of pyroxylin plastics, except as specified in Section 407.2, shall not be issued for a building or structure hereafter erected, altered or used which is occupied or located as described in the following Sections 407.3.1 through 407.3.5.

**407.3.1 Place of assembly:** Within fifty (50) feet of the nearest wall of a school, theatre or other place of public assembly.

### Notes applicable to Table 406

**Note a:** At a consumer site, if the aggregate water capacity of a multi-container installation comprised of individual containers having a water capacity of less than one hundred and twenty-five (125) gallons is five hundred and one (501) gallons or more, the minimum distance shall comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per container. If more than one such installation is made, each installation shall be separated from any other installation by at least twenty-five (25) feet. Do not apply the MINIMUM DISTANCES BETWEEN ABOVEGROUND CONTAINERS to such installations.

**Note b:** The following shall apply to aboveground containers installed alongside of buildings:

1. Portable DOT cylinder specification containers shall be located and installed so that the discharge from the container safety relief device is at least three (3) feet horizontally away from any building opening below the level of such discharge, and shall not be beneath any building unless this space is well ventilated to the outside and is not enclosed for more than fifty (50) percent of its perimeter. The discharge from container safety relief devices shall be located not less than five (5) feet in any direction away from openings into sealed combustion system appliances or mechanical ventilation air intakes.

2. ASME containers of less than one hundred and twenty-five (125) gallons water capacity shall be located and installed so that the discharge from safety relief devices shall not terminate in or beneath any building and shall be located at least five (5) feet horizontally away from any building opening below the level of such discharge, and not less than five (5) feet in any direction away from openings into sealed combustion system appliances or mechanical ventilation air intakes.

3. The filling connection and the vent from liquid level gages on either DOT or ASME containers filled at the point of installation shall be not less than ten (10) feet in any direction away from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

**Note c:** This distance may be reduced to not less than ten (10) feet for a single container of one thousand two hundred (1,200) gallons water capacity or less provided such container is at least twenty-five (25) feet from any other LP-Gas container of more than one hundred and twenty-five (125) gallons water capacity.

**407.3.2 Residential building:** As a residential building, use group R-1, R-2 or R-3.

**407.3.3 High hazard uses:** In quantities exceeding one thousand (1,000) pounds in buildings where paints, varnishes or lacquers are manufactured, stored or kept for sale; or where matches, resin, oils, hemp, cotton or any explosives are stored or kept for sale.

**407.3.4 Other flammable materials:** Where drygoods, garments or other materials of a highly flammable nature are manufactured in any portion of the building above that used for nitro-cellulose products.

**407.3.5 Tenant factory building:** In quantities exceeding one hundred (100) pounds in any tenant factory building (use group F) in which more than five (5) people are employed or likely to congregate on one (1) floor at any one (1) time.

**407.4 Inside storage:** All pyroxylin raw material and products intended for use in further manufacture shall be stored as herein provided on the following Sections 407.4.1 through 407.4.6.

**407.4.1 Cabinets:** Quantities of more than twenty-five (25) pounds and not more than five hundred (500) pounds shall be stored in approved cabinets constructed of noncombustible materials but the total quantity of storage shall not be more than one thousand (1,000) pounds in any workroom or space enclosed in floor, walls and ceilings of not less than two (2) hours fire-resistance rating.

**407.4.2 Vaults:** Quantities of more than one hundred (100) pounds and not more than ten thousand (10,000) pounds shall be stored in vaults enclosed in floors, walls and ceilings of not less than four (4) hours fire-resistance rating. The interior storage volume of the vault shall be not more than fifteen hundred (1500) cubic feet and the vault shall be constructed vapor and gastight in accordance with the approved rules, with one and one-half (1½) hour vapor-tight fire doors or the approved labeled fire door assembly equivalent on each side of the door opening. The vault shall be drained and provided with scuppers.

**407.4.3 Tote boxes and scrap containers:** During manufacture, pyroxylin materials and products not stored in finished stock rooms, cabinets or vaults shall be kept in approved covered noncombustible tote boxes. Scrap and other refuse material shall be collected in approved noncombustible containers in quantities not greater than three hundred and fifty (350) pounds and removed at frequent intervals as directed by the fire official.

**407.4.4 Ventilation:** Each separate compartment in storage vaults shall be vented directly to the outer air through flues complying with the requirements of the mechanical code listed in Appendix B for low temperature chimneys, or exterior metal smokestacks, or as otherwise provided in the approved rules. The vent shall discharge not less than four (4) feet above the roof of the building or on a street, court or other open space

not less than fifty (50) feet distance from any other opening in adjoining walls which are not in the same plane, nor nearer than twenty-five (25) feet vertically or horizontally to an exterior stairway, fire escape or exit-way discharge. The area of the vent shall be not less than one (1) square inch for each seven (7) pounds of pyroxylin stored.

**407.4.5 Structural strength:** The floors, walls, roof and doors of all vaults, structures or buildings used for the storage or manufacture of pyroxylin materials and products shall be designed to resist an inside pressure load of not less than three hundred (300) pounds per square foot (psf).

**407.4.6 Fire protection:** Vaults located within buildings for the storage of raw pyroxylin shall be protected with an approved automatic sprinkler system capable of discharging one and sixty-six one-hundredths (1.66) gallons per minute (gpm) per square foot over the area of the vault.

**407.5 Isolated storage buildings:** Pyroxylin products in quantities greater than permitted for interior storage shall be housed in isolated storage buildings. Such buildings shall not be used for any purpose other than packing, receiving, shipping and storage of pyroxylin plastics unless otherwise approved by the building official.

**407.5.1 Capacity:** The maximum storage in any fire area enclosed in construction of four (4) hours fire-resistance rating shall be not greater than one hundred thousand (100,000) pounds. The storage capacity of the building and its separation from lot lines and other buildings on the same lot shall be limited as provided in Table 407.5. When equipped with an approved automatic sprinkler system complying with the provisions of Article 12 and as herein modified, the exposure distances may be decreased fifty (50) per cent. Such systems shall be designed in accordance

**Table 407.5**  
**EXPOSURE DISTANCE FOR PYROXYLIN STORAGE BUILDINGS**

Maximum quantity stored in pounds	Fire separation from lot line or other buildings in feet
1,000	40
2,000	50
3,000	60
4,000	70
5,000	80
10,000	100
20,000	125
30,000	150
40,000	160
50,000	180
75,000	200
100,000	225
150,000	250
300,000	300

with Section 2061 of NFPA 40E, Pyroxylin Plastics, as listed in Appendix B.

#### **407.6 Fire protection**

**407.6.1 Heating equipment:** All radiators, heating coils, piping and heating apparatus shall be protected with approved noncombustible mesh to maintain a clearance of six (6) inches of all pyroxylin products from such equipment. All piping and risers within six (6) feet of the floor shall be insulated with approved noncombustible covering unless protected with wire guards.

**407.6.2 Electrical wiring and equipment:** All electrical wiring and equipment shall conform to the provisions of Article 15 and NFPA 40E, Pyroxylin Plastics, as listed in Appendix B.

**407.6.3 Standpipes:** First-aid standpipes shall be provided for each five thousand (5,000) square feet of floor area equipped with one and one-half (1½) inch hose, complying with Article 12.

**407.6.4 Automatic sprinklers:** All manufacturing and storage spaces and vaults where required shall be protected with an approved automatic sprinkler system as herein specified and with fire pails and portable fire extinguishers complying with Article 12 and the approved rules.

**407.6.5 Special protection:** Special chemical extinguishers and other first-aid fire appliances shall be provided around motors and other electrical equipment in accordance with the approved rules.

### **SECTION 408.0 USE AND STORAGE OF FLAMMABLE FILM**

**408.1 Permit required:** A permit for handling, use, storage or recovery of flammable film shall not be issued for any building located as specified in Section 407.3; except that those restrictions shall not apply to the screening and projection rooms of theatres and other places of amusement or instruction. It shall be unlawful to store, stock or use any nitrocellulose or other flammable film in quantities of more than two thousand (2,000) feet in length or more than ten (10) pounds in weight unless approved by the fire official. All installations shall comply with the applicable standards listed in Appendix B.

**408.2 Storage:** Other than motion picture projection and rewind rooms, or as herein specifically exempted, all rooms in which flammable film is stored or handled shall be enclosed in not less than two (2) hour fireresistive construction complying with the provisions of Article 9. All film, except when in process or use, shall be kept in approved closed containers.

**408.2.1 Cabinets:** Flammable film in amounts of twenty-five (25) to one thousand (1,000) pounds shall be stored in approved noncombustible cabinets constructed and vented in accordance with the approved rules.

One (1) cabinet shall not contain more than three hundred and seventy-five (375) pounds. All cabinets with a capacity of more than seventy-five (75) pounds shall be equipped with not less than one (1) automatic sprinkler head.

**408.2.2 Vaults:** Flammable film in amounts greater than one thousand (1,000) pounds shall be kept in vaults constructed as provided in Section 407.0; except that the interior storage volume shall not exceed seven hundred and fifty (750) cubic feet.

**408.2.3 Rooms:** Unexposed film may be stored in the original approved shipping cases complying with the rules of the Department of Transportation (DOT) in rooms equipped with an approved automatic sprinkler system complying with the provisions of Section 407.4.6.

**408.2.4 Ventilation:** Storage rooms shall be ventilated as specified in Section 407.4.4 with the vents arranged to open automatically in the event of fire, in accordance with the approved rules.

**408.2.5 Heating:** All heating equipment and installations shall conform to the requirements of Section 407.6.1. The duct systems of warm air heating and air conditioning systems shall comply with the mechanical code listed in Appendix B, and shall be protected with automatic fire dampers to cut off all rooms in which film is handled from all other rooms and spaces in the building. The heating of film vaults shall be automatically controlled to a maximum temperature of seventy (70) degrees F.

**408.2.6 Fire protection:** Approved automatic sprinkler systems shall be provided in all buildings and structures and parts thereof in which flammable film is stored or handled in amounts of more than fifty (50) pounds and as herein specifically required, except in projection rooms and rewind rooms conforming to the requirements of Section 408.3. First-aid fire-extinguishing and auxiliary fire-fighting equipment shall be provided in accordance with Article 12 and the approved rules adopted thereunder.

**408.3 Projection room required (scope):** The provisions of this section shall apply to rooms in which ribbon-type cellulose acetate or other safety film is used in conjunction with electric arc, xenon or other light source projection equipment which develops hazardous gases, dust or radiation. Where cellulose nitrate film is used, projection rooms shall comply with NFPA 40, listed in Appendix B.

Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, may be within the projection room or in an adjacent room of equivalent construction. There shall be posted on the outside of each projection room door and within the projection room itself a conspicuous sign with one (1) inch block letters stating: *Safety film only permitted in this room.*



**408.3.1 Construction of projection rooms:** Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings need not be protected.

The room shall have a floor area of not less than eighty (80) square feet for a single machine. Each motion picture projector, flood light, spotlight or similar piece of equipment shall have a clear working space of not less than thirty (30) inches by thirty (30) inches on each side and at the rear thereof, but only one (1) such space shall be required between two (2) adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than seven (7) feet, six (6) inches. The aggregate of openings for projection equipment shall not exceed twenty-five (25) per cent of the area of the wall between the projection room and the auditorium. All openings shall be provided with glass or other approved material, so as to completely close the opening.

**408.3.2 Means of egress from projection rooms:** Exiting shall be provided as required in Article 6.

**408.3.3 Ventilation of projection rooms:** Ventilation shall be provided in accordance with the provisions of this section.

**408.3.3.1 Projection room**

1. **Supply air:** Each projection room shall be provided with two (2) or more separate fresh air inlet ducts with screened openings terminating within twelve (12) inches of the floor, and located at opposite ends of the room. Such air inlets shall be of sufficient size to permit an air change every three (3) minutes. Fresh air may be supplied from the general building air conditioning system; but when this is done, it shall be so arranged that the projection room will continue to receive one (1) change of air every three (3) minutes, regardless of the status of the general air conditioning system.
2. **Exhaust air:** Each projection room shall be provided with one (1) or more exhaust air outlets which may be manifolded into a single duct outside the room. Such outlets shall be so located as to insure circulation throughout the room. Projection room exhaust air systems shall be independent of any other air systems in the building. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily recirculated into the supply air system. The exhaust system shall be mechanically operated and of such a capacity as to provide a minimum of one (1) change of air every three (3) minutes. The blower motor shall be outside the duct system. The projection room ventilation system may also serve appurtenant rooms, such as the generator room and the rewind room.

**408.3.3.2 Projection equipment ventilation:** Each projection machine



shall be provided with an exhaust duct which will draw air from each lamp and exhaust it directly to the outside of the building in such a fashion that it will not be picked up by supply inlets. Such a duct shall be of rigid materials, except for a continuous flexible connector for the purpose. The lamp exhaust system shall not be interconnected with any other system.

1. **Electric arc projection equipment:** The exhaust capacity shall be two hundred (200) cubic feet per minute (cfm) for each lamp connected to the lamp exhaust system, or as recommended by the equipment manufacturer. Auxiliary air may be introduced into the system through a screened opening to stabilize the arc.
2. **Xenon projection equipment:** The lamp exhaust system shall exhaust not less than three hundred (300) cubic feet per minute (cfm) per lamp, nor less than that exhaust volume required or recommended by the equipment manufacturer, whichever is the greater. The external temperature of the lamp housing shall not exceed one hundred thirty (130) degrees F., when operating.

**408.3.4 Lighting control:** Provision shall be made for control of the auditorium lighting and the emergency lighting systems of theatres from inside of the room and from at least one (1) other convenient point in the building as required in Section 417.9.

**408.3.5 Miscellaneous equipment:** Each projection room shall be provided with rewind and film storage facilities. A maximum of four (4) containers for flammable liquids not greater than sixteen (16) ounce capacity and of a nonbreakable type may be permitted in each projection room.

**408.3.6 Sanitary facilities:** Every projection room shall be provided with a lavatory. Every projection room serving an assembly occupancy shall be provided with a water closet.

**408.4 Screening rooms:** Screening rooms shall provide a seating capacity of not more than thirty (30) persons, with not less than two (2) approved means of egress complying with Article 6. Such rooms shall be enclosed in one (1) hour fire separation walls with self-closing fire doors or their approved labeled equivalent at the openings. All seats shall be permanently fixed in position and the arrangement shall comply with the requirements of Section 417.4.

**408.5 Temporary motion picture installations:** Permits for portable and temporary room construction for incidental amusement and educational purposes shall be secured from the fire official in accordance with the approved rules.

#### **408.6 Motion picture studios**

**408.6.1 Construction:** All buildings designed or used as motion picture studios shall be protected with an approved two (2) source automatic sprinkler system complying with the provisions of Article 12; except that

the building official may exempt rooms designed for housing electrical equipment from this requirement when constructed of fireproof (Type 1) construction.

**408.6.2 Special rooms:** Rooms and spaces used as carpenter and repair shops, dressing rooms, costume and property stage rooms shall be enclosed in floors, walls and ceilings of not less than two (2) hour fire-resistance rated construction.

**408.6.3 Trim, finish and decorative hangings:** All permanently attached acoustic, insulating and light reflecting materials and temporary hangings on walls and ceilings shall comply with the requirements of Article 9.

**408.6.4 Cellulose nitrate film storage:** All cellulose nitrate film shall be stored as required in Section 408.2 and surplus film shall not be kept on the studio stage except loaded magazines in the cameras and sound recording apparatus. All extra loaded magazines shall be stored in a separate magazine room enclosed in two (2) hour fire-resistance rated construction.

**408.7 Film laboratories:** Film laboratories shall not be conducted in other than fireproof (Type 1A) buildings or structures, equipped throughout with an approved automatic sprinkler system.

**408.8 Film exchanges:** All film exchanges and depots shall be housed in buildings and structures of fireproof (Type 1A) construction equipped throughout with an approved automatic sprinkler system. All flammable film other than that in process of receipt, delivery or distribution shall be stored in vaults complying with the requirements of Section 407.4.2.

## **SECTION 409.0 USE AND STORAGE OF COMBUSTIBLE FIBERS**

**409.1 General:** The provisions of this section shall apply to all buildings and structures involving the storage or use of finely divided combustible vegetable or animal fibers and thin sheets or flakes of such materials involving flash fire hazard, including among others cotton, excelsior (shredded paper), hemp, sisal, jute, kapok and paper and cloth in the form of scraps and clippings in excess of one thousand (1,000) pounds. The provisions of the applicable standards listed in Appendix B except as herein specifically provided shall be deemed to conform to the provisions of this code.

**409.2 Construction requirements:** All buildings designed for the storage of combustible fibers as herein described shall be constructed within the limits of height and area specified in Table 305 for high hazard use (use group H) except as described in the following Sections 409.2.1 through 409.2.6.

**409.2.1 Special limits:** A single storage room or space shall not be more

than five thousand (5,000) square feet in area or more than fifty thousand (50,000) cubic feet in volume unless of protected non-combustible (Type 2B) or better construction.

**409.2.2 Floor loads:** The floors of all buildings designed for the storage of combustible fibers shall not be loaded in excess of one-half ( $\frac{1}{2}$ ) the safe load capacity of the floor, nor shall such materials be piled to more than two thirds ( $\frac{2}{3}$ ) of the clear story height.

**409.2.3 Salvage doors:** Every exterior wall shall be provided with a door to each storage compartment arranged for quick removal of the contents.

**409.2.4 Wall openings:** All openings in outside walls shall be equipped with approved fire doors and fire windows complying with Article 9.

**409.2.5 Roof openings:** All skylights, monitors and other roof openings shall be protected with galvanized wire or other approved corrosion-resistive screens with not less than thirty-six (36) meshes to the square inch or with wire glass in stationary frames.

**409.2.6 Boiler rooms:** All power and heating boilers and furnaces shall be located in detached boiler houses or in a segregated boiler room enclosed in three (3) hour fire-resistance rated construction with direct entrance from the outside, except that rooms containing gas-fired heating equipment may have openings into the warehouse protected with one and one-half ( $1\frac{1}{2}$ ) hour fire doors or their approved labeled equivalent.

**409.3 Fire protection:** Fire protection equipment shall be provided complying with Article 12 consisting of casks, pails and portable chemical extinguishers and standpipes. Where deemed necessary by the administrative authority, a system of outside hydrants and hose shall be provided.

**409.4 Housekeeping:** Ashes, waste, rubbish or sweepings shall not be kept in wood or other combustible receptacles and shall be removed from the premises daily. Grass or weeds shall not be allowed to accumulate at any point on the premises.

**409.5 Open storage:** Only temporary open storage of combustible fibers shall be permitted on the same premises with a fiber warehouse and shall be kept covered on top and sides with tarpaulins secured in place. Not more than seven thousand two hundred (7,200) cubic feet of fiber shall be stored in the open; and fire-extinguishing equipment shall be provided as directed by the administrative official.

**409.6 Special treatments:** When combustible fibers are packed in special noncombustible containers or when packed in bales covered with wrappings to prevent ready ignition, or when treated by approved chemical dipping or spraying processes to eliminate the flash fire hazard, the restrictions governing combustible fibers shall not apply.

## SECTION 410.0 COMBUSTIBLE DUSTS, GRAIN PROCESSING AND STORAGE

**410.1 General:** The provisions of this section shall apply to all buildings in which materials producing flammable dusts and particles which are readily ignitable and subject to explosion hazards are stored or handled, including, among others, grain bleachers and elevators, malt houses, flour, feed or starch mills, wood flour manufacturing and manufacture and storage of pulverized fuel and similar uses. The applicable standards listed in Appendix B, except as herein specifically required, shall be deemed to conform to the requirements of this code.

### 410.2 Construction requirements

**410.2.1 Buildings:** All such buildings and structures, unless herein otherwise specifically provided, shall be of fireproof (Type 1), noncombustible (Type 2), or of laminated planks or lumber sizes qualified for heavy timber mill (Type 3A) construction, within the height and area limits of high hazard uses (use group H) of Table 305; except that when erected of fireproof (Type 1A) construction, the height and area of grain elevators and similar structures shall be unlimited, and when of heavy timber (Type 3A) construction, the structure may be erected to a height of sixty-five (65) feet; and except further that, in isolated areas, the height of Type 3A structures may be increased to eighty-five (85) feet.

**410.2.2 Grinding rooms:** Every room or space for grinding or other operations producing flammable dust shall be enclosed with floors and walls of not less than two (2) hour fireresistance rating when the area is not more than three thousand (3,000) square feet and of not less than four (4) hour fireresistance rating when the area is greater than three thousand (3,000) square feet.

**410.2.3 Conveyors:** All conveyors, chutes, piping and similar equipment passing through the enclosures of such rooms or spaces shall be constructed dirt and vapor tight, of approved noncombustible materials complying with Section 1618.0.

**410.3 Explosion relief:** Means for explosion relief shall be provided as specified in Section 401.0, or such spaces shall be equipped with the equivalent mechanical ventilation complying with the mechanical code listed in Appendix B.

**410.4 Grain elevators:** Grain elevators, malt houses and buildings for similar uses shall not be located within thirty (30) feet of interior lot lines or structures on the same lot, except when erected along a railroad right of way.

**410.5 Coal pockets:** Coal pockets located less than thirty (30) feet from interior lot lines or structures on the same lot shall be constructed of not less than protected noncombustible (Type 2A) construction. When more than thirty (30) feet from interior lot lines, or erected along a railroad right of way, such structures may be built of lumber sizes qualifying

for heavy timber or laminated construction, provided they are not more than sixty-five (65) feet in height.

## **SECTION 411.0 PAINT SPRAYING AND SPRAY BOOTHS**

**411.1 General:** The provisions of this section shall apply to the construction, installation and use of buildings and structures or parts thereof for the spraying of flammable paints, varnishes and lacquers or other flammable materials, mixtures or compounds used for painting, varnishing, staining or similar purpose. All such construction and equipment shall comply with the approved rules and the applicable standards listed in Appendix B.

**411.2 Location of spraying processes:** Such processes shall be conducted in a spraying space, spray booth, spray room or shall be isolated in a detached building or as otherwise approved by the building official in accordance with accepted engineering practice.

### **411.3 Construction**

**411.3.1 Spray spaces:** All spray spaces shall be ventilated with an approved exhaust system to prevent the accumulation of flammable mist or vapors. When such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of fire.

**411.3.2 Spray booths:** All spray booths shall be constructed of approved noncombustible materials equipped with mechanical ventilating systems.

**411.3.3 Spray rooms:** All spray rooms shall be enclosed in partitions of not less than one (1) hour fireresistance rating. Floors shall be water-proofed and drained in an approved manner. Floor drains to the building drainage system and the public sewer shall be prohibited.

**411.3.4 Storage rooms:** Spraying materials in quantities of not more than twenty (20) gallons may be stored in approved cabinets ventilated at top and bottom; when in quantities of more than twenty (20) gallons and not more than one hundred (100) gallons, they may be stored in approved double-walled noncombustible cabinets vented directly to the outer air; and all spraying materials in quantities of more than one hundred (100) gallons shall be stored in an enclosure of not less than two (2) hour fireresistance rating or in a separate exterior storage building. Such storage shall not be in quantities of more than two hundred and fifty (250) gallons, except when stored in isolated storage buildings; and except further that not more than twenty-five (25) gallons of spraying material shall be stored in buildings in which pyroxylin products are manufactured or stored.

**411.4 Ventilation of spraying processes:** The ventilation system shall comply with the provisions of Section 401.0 and shall be adequate to exhaust all vapors, fumes and residues of spraying material directly to

the outer air. Fresh air shall be admitted to the spraying spaces in an amount equal to the capacity of the fan in such manner as to avoid short circuiting the path of air in the working space and to provide air movement with a velocity of not less than one hundred (100) feet per minute at the face of the spray booth. All ducts and vents shall be constructed and installed to comply with the mechanical code listed in Appendix B. Unless equipped with approved explosion-proof motors with nonferrous fan blade fans, the mechanical exhaust equipment shall be located outside of spray spaces.

**411.5 Fire protection:** Sprinkler heads shall be provided in all spray, dip and immersing spaces and storage rooms and shall be installed in accordance with accepted engineering practice and the standards listed in Appendix B. Where buildings containing spray areas are not equipped with an approved automatic sprinkler system, the sprinkler heads in booths and other spray areas and storage rooms may be supplied from the building water supply when approved by the building official, to comply with the provisions of Section 1205.0.

## SECTION 412.0 DRY CLEANING ESTABLISHMENTS

**412.1 General:** Before any dry cleaning plant is constructed or an existing plant is remodeled or altered, complete drawings shall be filed showing to scale the relative location of the dry cleaning area, the boiler room, finishing department, solvent storage tanks, pumps, washers, drying tumblers, extractors, filter traps, stills, piping and all other equipment involving the use of flammable liquid solvents. All dry cleaning by immersion and agitation shall be carried on in closed machines, installed and operated in accordance with the approved rules and the applicable standards listed in Appendix B.

**412.2 Classification:** For the purpose of this code, all dry cleaning and dry dyeing establishments shall be classified as described in the following Sections 412.2.1 through 412.2.3.

**412.2.1 High hazard:** All such establishments shall be classified as high hazard which employ gasoline or other solvents having a flash point below one hundred (100) degrees F. (ASTM D56) in quantities of more than three (3) gallons, or more than sixty (60) gallons of flammable solvents with a flash point between one hundred (100) and one hundred and forty (140) degrees F. (ASTM D56).

**412.2.2 Moderate hazard:** All such establishments employing less than three (3) gallons of volatile flammables with a flash point of less than one hundred (100) degrees F. or less than sixty (60) gallons of solvent with a flash point between one hundred (100) and one hundred and forty (140) degrees F. (ASTM D56) shall be classified as moderate hazard.

**412.2.3 Low hazard:** All such establishments using solvents of other than volatile flammable liquids or solvents with a flash point more than



one hundred and forty (140) degrees F. (ASTM D56) in cleaning and dyeing operations shall be classified as low hazard.

#### **412.3 Construction of dry cleaning plants**

**412.3.1 High hazard:** High hazard dry cleaning plants as herein defined shall be located in buildings or structures of fireproof (Type 1A) construction, not more than one (1) story in height with solid floors and roofs and without openings other than required for egress and ventilation purposes. Such a building shall not be used for any other purpose.

**412.3.2 Moderate hazard:** Moderate hazard dry cleaning plants as herein defined may be located in buildings or structures of any type of construction other than frame (Type 4) buildings subject to the fire limit restrictions of Article 3 and the height and area limitations for high hazard buildings (use group H) of Table 305. The room or space in which such operations are conducted shall be enclosed in not less than two (2) hour fire-resistance rated construction with not less than two (2) means of egress from each dry cleaning or dry dyeing room or space.

**412.3.3 Low hazard:** Low hazard dry cleaning plants shall not be restricted as to type of building construction within the height and area limitations for use group B of Table 305; except that such uses shall not be located in basements nor in a building used for public assembly (use group A) or institutional (use group I) purposes.

**412.3.4 Roof construction of dry cleaning plants:** The roof over high hazard dry cleaning plants shall be flat without attic or concealed spaces and shall be provided with a pivot type skylight or other approved vent complying with Section 401.0, arranged to release outwardly under explosion pressures.

**412.3.5 Floor construction of dry cleaning plants:** The floor finish in high hazard dry cleaning plants shall be constructed of water-resistant, noncombustible materials with nonsparking surface elevated above the adjoining grade and with door sills not less than ten (10) inches in height. There shall not be openings, vaults or pits below the floor.

**412.3.6 Exterior walls of dry cleaning plants:** Exterior walls of high hazard dry cleaning plants having a fire separation of less than thirty (30) feet shall be solid masonry without openings, but more than two (2) sides of the building shall not be enclosed in blank walls. Opening protectives of exterior doors and windows shall have not less than three-quarter ( $\frac{3}{4}$ ) hour fire-resistance or the labeled equivalent construction, and the windows shall be pressure-releasing to comply with Section 401.0.

**412.3.7 Basements of dry cleaning plants:** The basements of all buildings in which high or moderate hazard dry cleaning establishments are conducted shall be completely separated from the superstructure with unpierced floor construction of not less than two (2) hours fire-resistance rating. The access to such basements shall be from the exterior only.

**412.4 Boiler room separation:** Boiler rooms and heating equipment for high hazard dry cleaning plants shall be separated from drying rooms, dry cleaning and dry dyeing rooms with unpierced walls of not less than four (4) hours fireresistance rating and in moderate hazard establishments with solid walls of not less than two (2) hours fireresistance rating; or such boiler rooms shall be located in a separate building.

**412.5 Ventilation:** All rooms and spaces in high hazard dry cleaning plants shall be provided with a mechanical system of ventilation capable of twenty (20) complete and continuous changes of air per hour. Mechanical systems of ventilation in moderate hazard shall have sufficient capacity to insure ten (10) complete and continuous changes of air per hour. Satisfactory mechanical or natural ventilation shall be provided in low hazard plants by means of fans, pipes and ducts to ventilate drying tumblers, drying cabinets and similar equipment directly to the outer air.

**412.6 Solvent storage:** All volatile flammable solvents with a flash point under seventy-five (75) degrees F. (ASTM D56) shall be stored underground in accordance with the provisions of Section 402.0. Interior aboveground storage shall be permitted for solvents with a flash point above seventy-five (75) degrees F. (ASTM D56) provided the aggregate quantity of such solvent in use in the system and in storage is not more than five hundred and fifty (550) gallons and the capacity of any individual tank is not more than two hundred and seventy-five (275) gallons.

**412.7 Fire protection:** Every dry cleaning room, and dry dyeing room employing high and moderate hazard solvents shall be protected with a fire protection system consisting of approved automatic sprinklers, manually controlled steam-blankets, carbon dioxide flooding systems or other approved fire-extinguishing equipment.

## SECTION 413.0 PRIVATE GARAGES

### 413.1 Attached garages

**413.1.1 One- and two-family dwellings:** Private garages located beneath a one- and two-family dwelling shall have walls, partitions, floors and ceilings separating the garage space from the dwelling constructed of not less than one (1) hour fireresistance rating. Private garages attached to a one- and two-family dwelling shall be completely separated from the dwelling and its attic area by means of one-half ( $\frac{1}{2}$ ) inch gypsum board or equivalent applied to the garage side. The sills of all door openings between the garage and dwelling shall be raised not less than four (4) inches above the garage floor. The door opening protectives shall be one and three-quarter ( $1\frac{3}{4}$ ) inch solid core wood doors or approved equivalent.

**413.1.2 Motels and multi-family dwellings:** Private garages located beneath motels and multi-family dwellings and in which gasoline or oil



is not stored or handled shall be of protected construction of not less than one and one half (1½) hour fire resistance rating.

**413.1.3 Separation by breezeway:** A garage separated from residence outside the fire limits by a breezeway not less than ten (10) feet in length may be of unprotected frame (Type 4B) construction, but the junction of the garage and breezeway shall be firestopped to comply with Section 875.0.

**413.1.4 Other conditions:** All private garages not falling within the purview of Sections 413.1.1, 413.1.2, or 413.1.3, attached to or located beneath a building shall comply with the requirements of Section 414.2.3 for public garages.

**413.1.5 Heating equipment:** Boilers, furnaces, hot water heaters or any other appliances having an open flame or exposed heated surfaces shall not be located in a private garage unless precautions are taken to protect such equipment from impact by automobiles. This equipment shall have the combustion chamber, ash pit etc., raised a minimum of eighteen (18) inches above the floor to eliminate a possible source of ignition.

**413.2 Means of egress:** Where living quarters are located above a private garage, required means of egress facilities shall be protected from the garage area with one (1) hour fire resistance rated construction.

## SECTION 414.0 PUBLIC GARAGES

**414.1 General:** Public garages shall comply with the applicable requirements of this section. The portions of such buildings and structures in which gasoline, oil and similar products are dispensed shall comply with the requirements of Section 415.0; the portions in which motor vehicles are repaired shall comply with Section 416.0; and the portions in which paint spraying is done shall comply with the requirements of Section 411.0.

**414.2 Construction:** All Group 1 public garages hereafter erected shall be classified as storage buildings, moderate hazard (use group S-1) and all Group 2 public garages shall be classified as storage buildings, low hazard (use group S-2) and shall conform to the height and area limitations of Table 305 except as herein specifically provided. The areas used for dispensing gasoline in such buildings shall be located on the grade floor and shall comply with the requirements of Section 415.0.

**414.2.1 Special height limitations:** Public garage buildings shall comply with the height and area limitations of Table 305 for the classification of the use as specified in Section 414.2. Such heights may be increased one (1) additional story when the building is equipped with an approved automatic fire suppression system.

**414.2.2 Basements:** The first floor construction of public garages of all classifications and public hangars with basements shall be constructed of not less than two (2) hour fire-resistance rating and shall be water and vapor proof. Where openings are provided in the floor they shall be protected by a curb or ramp not less than six (6) inches high above the floor to avoid the accumulation of explosive liquids or vapors and prevent them from spilling to the lower floor. There shall be not less than two (2) means of egress from such areas, one (1) of which shall be directly to the outside independent of the exitways serving other areas of the building.

**414.2.3 Mixed occupancy:** A public garage shall not be located within or attached to a building occupied for any other use, unless separated from such other use by walls or floors complying with Table 902 for fire-resistance rating. Such fire separation walls shall be continuous and unpierced by openings; except that door openings equipped with self-closing fire doors complying with Article 9 shall be permitted. In buildings of single occupancy not excluding the area limitations of Table 305, doors without a fire-resistance rating shall be permitted between the garage area and salesroom or offices that are operated in connection with the garage.

**414.2.4 Roof storage of motor vehicles and airplanes:** The roof of a public garage shall not be used for the parking or storage of motor vehicles unless the building is of fireproof construction (Type 1A or 1B). When the roof of a building is used for parking or storage of motor vehicles it shall be provided with a parapet wall or guard rail not less than three (3) feet six (6) inches in height and a wheel guard not less than six (6) inches in height, located so as to prevent any vehicle from striking the parapet wall or guard rail. The use of roofs for airplanes storage and landing shall be subject to the approval of the Federal Aviation Administration, if required.

**414.2.5 Floor construction and drainage:** Floors of public garages and airplane hangars shall be graded to drain through oil separators or traps to avoid accumulation of explosive vapors in building drains or sewers as provided in the plumbing code. The floor finish shall be of concrete or other approved nonabsorbent, noncombustible material.

**414.3 Ventilation:** All public garages and airplane hangars shall be provided with mechanical or natural ventilation adequate to prevent the accumulation of carbon monoxide or exhaust fumes in excess of one (1) part in ten thousand (10,000) or one one-hundredth of one per cent (.01%) or the concentration of gasoline vapors in excess of twenty (20) per cent of the lower explosive limit. The building official may require test by a qualified testing laboratory to determine the adequacy. The cost of test shall be borne by the owner.

**414.3.1 Below grade:** Enclosed and below grade public garages shall

be equipped with mechanical ventilation adequate to provide six (6) air changes per hour. The ventilation system shall be operated at all times the garage areas are occupied by human beings.

**414.3.2 Repair shops or rooms:** When motor vehicles are to be operated or engines are run for test purposes or minor adjustments, provisions shall be made to collect the exhaust fumes from each vehicle individually and to discharge such fumes to the outer air by means of a positive induced draft. The discharge from such system shall be located so as not to create a hazard to adjoining properties, but not less than eight (8) feet above the adjacent ground level on the exterior of the building and shall discharge into a yard or court. When necessary to discharge across a walkway or private thoroughfare, the discharge opening shall be carried to a height of not less than twenty-five (25) feet above the ground level or to a distance four (4) inches above the highest point of the wall of the building or structure on which it is located.

**414.3.3 Pits:** Pits shall not be installed in floors below the first; and pits in first and upper stories shall be provided with mechanical ventilation adequate to provide the ventilation required under Section 414.3. The ventilation system shall be operated at all times the pits are occupied by human beings.

**414.4 Special hazards:** Any process conducted in conjunction with public garages involving volatile flammable solvents shall be segregated or located in a detached building or structure, except as provided in Section 402.0 for the storage and handling of gasoline and other volatile flammables. The quantity of flammable liquids stored or handled in public garages other than in underground storage and in the tanks of motor vehicles shall be not more than five (5) gallons in approved safety cans.

**414.5 Heating and protection of equipment:** Radiation and heating coils and pipes located within six (6) inches of the floor shall be protected with wire mesh or other approved noncombustible shields of adequate strength; and with asbestos or other insulation on top of the equipment when located in partitions or near combustible racks or woodwork.

**414.6 Boiler rooms of public garages:** All heat generating plants other than approved direct fired heaters shall be located in separate buildings or shall be separately enclosed within the structure with solid, water and vapor tight masonry. All rooms housing boilers, stoves or other heating apparatus shall be cut off from all other parts of the building with four (4) hour fire-resistance rated construction with entrance from outside only, and these shall not be openings through the fire separation wall other than those necessary for heating pipes or ducts.

## SECTION 415.0 MOTOR FUEL SERVICE STATIONS

**415.1 Construction:** Buildings and structures used for the storage and sale of motor fuel oils may be of all types of construction within the height and area limitations of Table 305 for business (use group B) buildings and as modified by Section 302.0. The canopies and supports over pumps and service equipment when located less than twenty (20) feet from interior lot lines shall be constructed of approved noncombustible materials, Type 3A (heavy timber) construction, or one (1) hour fire-resistance rated construction.

**415.1.1 Exceptions:** Approved plastics conforming to the requirements of Article 20 may be used in canopies over pumps when conforming to the following requirements.

1. The canopies are located at least ten (10) feet from any building on the same property and face yards or streets not less than forty (40) feet wide on the other sides;
2. the aggregate area of plastic in each canopy shall not exceed two-hundred (200) square feet in the fire limits or one thousand (1,000) square feet outside the fire limits; and
3. the maximum area of each panel shall not exceed one hundred (100) square feet.

**415.1.2 Opening protectives:** All permissible openings in walls with a fire separation of less than twenty (20) feet shall be protected with approved fire windows or fire doors complying with Article 9, except doors in such walls to rest rooms.

**415.1.3 Basements:** Motor fuel service stations shall not have cellars or basements; and when pits are provided they shall be vented as required in Section 414.3.

**415.2 Gasoline storage:** All volatile flammable liquid storage tanks shall be installed below ground and vented as specified in Section 402.0. Gasoline may be stored or handled above ground in approved safety cans of not more than five (5) gallons each.

**415.3 Location of pumps:** Gasoline pumps or other mechanical equipment shall not be installed so as to permit servicing of motor vehicles standing on a public street or highway; except when necessitated by the widening of streets or highways, the use of the outer driveway of existing service stations may be continued for servicing of vehicles when approved by the authority having jurisdiction.

## SECTION 416.0 MOTOR VEHICLE REPAIR SHOPS

**416.1 General:** All buildings and structures designed and used for repair and servicing motor vehicles, motor boats, airplanes or other motor driven means of transportation shall be subject to the limitations

of Tables 214 and 305 for moderate hazard storage (use group S-1). Such buildings shall be used solely for that purpose.

**416.2 Enclosure walls:** Exterior walls, when located within six (6) feet of interior lot lines or other buildings, shall not have openings therein.

**416.3 Handling of volatile flammables:** All volatile flammables shall be stored and handled as provided in Section 415.2.

**416.4 Ventilation:** All rooms and spaces used for motor vehicle repair shop purposes shall be provided with an approved system of mechanical ventilation meeting the requirements of Section 414.3 and the mechanical code listed in Appendix B.

**416.5 Fire prevention:** Open gas flames except heating devices complying with Section 414.6, torches, welding apparatus, or other equipment likely to create an open flame or spark shall not be located in a room or space in which flammable liquids or highly combustible materials are used or stored.

## SECTION 417.0 PLACES OF PUBLIC ASSEMBLY

**417.1 Applicability:** The provisions of this section shall apply to all places of public assembly and all parts of buildings and structures classified in the use group A-1, theatres and in other places of public assembly, use groups A-2, A-3, and A-4, except as specifically exempted in Section 418.0.

### 417.2 Restrictions

**417.2.1 High hazard uses:** A place of public assembly shall not be permitted in a building classified in the high hazard group (use group H).

**417.2.2 Superimposed theatres:** An addition or extension shall not be erected over the stage section of a theatre, nor shall a second theatre be erected above another. The building official may waive the prohibition against superimposed theatres and construction above the stage when adequate access is provided for fire fighting with direct means of ventilation to the outer air from the stage portion.

**417.2.3 Frame construction:** A theatre with stage, fly gallery and rigging loft shall not be permitted in a building of unprotected frame (Type 4B) construction.

**417.2.4 Location:** All buildings used for assembly purposes shall front on at least one (1) street in which the main entrance and exitway discharge shall be located. The total capacity of such main exitway shall be not less than one-third ( $\frac{1}{3}$ ) of the total required width of building exitways.

**417.2.5 Trim, finish and decorative hangings:** All permanent acoustic

insulating and similar materials and temporary hangings shall comply with the flameresistance requirements of Article 9. Moldings and decorations around the proscenium openings shall be constructed entirely of noncombustible material.

**417.2.6 Existing buildings:** Nothing herein contained shall prohibit the alteration of a building heretofore occupied as a place of public assembly for such continued use provided the occupancy load is not increased and seats, aisles, passageways, balconies, stages, appurtenant rooms and all special permanent equipment comply with the requirements of this article.

**417.2.7 New buildings:** A building not heretofore occupied as a place of public assembly shall not hereafter be altered to be so occupied unless it is made to comply with all the provisions of this article.

### **417.3 Theatre means of egress requirements**

**417.3.1 Types of exitways:** The required exitways from every tier or floor of a theatre shall consist of grade exitway discharge doors, interior or exterior stairways or horizontal exits which provide direct access to a street, an exitway discharge court, or unobstructed passageway, hallway or lobby leading to a street or open public space. The number, location and construction of all means of egress facilities shall comply with the requirements of Article 6 and the applicable standards listed in Appendix B, except as herein specifically provided.

**417.3.2 Number of stairways in auditorium:** Each tier above the main floor of a theatre or other auditorium shall be provided with at least two (2) interior enclosed stairways which shall be located on opposite sides of the structure; except that enclosures shall not be required for stairs serving the first balcony only, or mezzannie thereunder. Such stairways shall discharge to a lobby on the main floor. Exitway stairways serving galleries above the balcony shall lead directly to the street or open public space as provided in Section 417.3.1.

**417.3.3 Emergency means of egress from main floor of auditorium:** In addition to the main floor entrance and exitway, emergency exitway discharge doors shall be provided on both sides of the auditorium which lead directly to a street, or through a passageway to the street independent of other exitways, or to an exitway discharge court as defined in this code.

**417.3.4 Emergency means of egress from balconies and galleries:** Emergency exitways shall be provided from both sides of each balcony and gallery with direct egress to the street, or to an independent passageway, or to an exitway discharge court. There shall not be communication from any portion of the building to the emergency exitway stairways except from the tier for which such exitway is exclusively intended.

**417.3.5 Exitway discharge courts:** All exitway discharge courts shall

be not less than six (6) feet wide for the first six hundred (600) persons to be accommodated or fraction thereof, and shall be increased one (1) foot in width for each additional two hundred and fifty (250) persons. Such courts shall extend sufficiently in length to include the side and rear emergency exitways from the auditorium.

**417.3.6 Hardware:** Latches or bolts on all means of egress doorways shall be of an approved self-releasing, panicproof type complying with Section 612.5.2.

**417.3.7 Width of exitway doors:** The maximum width of single exitway doors shall be forty-two (42) inches and the minimum width of double doorways shall be sixty (60) inches.

**417.3.8 "Exit" lights:** All exitway doors shall be marked with illuminated *Exit* signs complying with Section 623.0 which shall be kept lighted at all times during occupancy of the building.

#### **417.4 Theatre seatings**

**417.4.1 Fixed seats:** In all theatres and similar places of assembly except churches, stadiums and reviewing stands, individual fixed seats shall be provided with an average width of not less than twenty (20) inches and seats shall not be less than nineteen (19) inches wide. All seats shall be provided with separating arms and arranged in rows not less than thirty-two (32) inches apart, back to back, measured horizontally.

**417.4.2 Number of seats:** Aisles shall be provided so that not more than six (6) seats intervene between any seat and the aisle or aisles, except that the number of seats in a row shall not be limited when self-raising seats are provided which leave an unobstructed passage between rows of seats of not less than eighteen (18) inches in width leading to side aisles in which exitway doorways are located at not more than twenty-five (25) foot intervals to the exitway corridor or exitway discharge court.

**417.4.3 Box seats:** In boxes or loges with level floors, the seats need not be fastened when not more than fourteen (14) in number.

#### **417.5 Theatre aisles**

**417.5.1 Longitudinal aisles:** The width of longitudinal aisles at right angles to rows of seats and with seats on both sides of the aisle shall be not less than thirty-six (36) inches, increasing one-quarter ( $\frac{1}{4}$ ) inch for every foot of length of aisle from its beginning to an exitway door, or to a cross aisle or between cross aisles. The width of the longitudinal aisles with banks of seats on one side only shall be not less than thirty (30) inches, increasing one-quarter ( $\frac{1}{4}$ ) inch for each foot of length.

**417.5.2 Cross aisles:** When there are twenty-seven (27) or more rows of seats on the main floor of theatres, cross aisles shall be provided so that a block of seats shall not have more than twenty-two (22) rows. The



width of cross aisles shall be not less than the widest aisle with which they connect or the width of exitway which they serve; but a cross aisle shall not be less than forty-two (42) inches wide, or when bordering on means of entrance not less than forty-eight (48) inches wide. In balconies and galleries of theatres, one (1) or more cross aisles shall be provided when there are more than ten (10) rows of seats.

**417.5.3 Gradient:** Aisles shall not exceed a gradient of one and three-quarter ( $1\frac{3}{4}$ ) inches per foot.

**417.5.4 Balcony steps:** Steps may be provided in balconies and galleries only, and such steps shall extend the full width of the aisle with treads and risers complying with Article 6, which shall be illuminated by lights on both sides or by a step light or otherwise to insure an intensity of not less than one (1) foot candle.

**417.5.5 Railings:** Metal or other approved noncombustible railings shall be provided on balconies and galleries as prescribed below.

1. At the fascia of boxes, balconies and galleries not less than thirty (30) inches in height; and not less than thirty-six (36) inches in height at the foot of steps;
2. along cross aisles not less than twenty-six (26) inches in height except where the backs of the seats along the front of the aisle project twenty-four (24) inches or more above the floor of the aisle; and
3. where seatings are arranged in successive tiers, and the height of rise between platforms exceeds eighteen (18) inches, not less than twenty-six (26) inches in height along the entire row of seats at the edge of the platform.

#### **417.6 Theatre foyers**

**417.6.1 Capacity:** In every theatre or similar place of public assembly, not including churches, for theatrical use with stage and scenery loft, a foyer or lobby shall be provided with a net floor area, exclusive of stairs or landings, of not less than one and one-half ( $1\frac{1}{2}$ ) square feet for each occupant having access thereto. The use of foyers and lobbies and other available spaces for harboring occupants until seats become available shall not encroach upon the clear floor area herein prescribed or upon the required clear width of front exitways.

**417.6.2 Egress:** When the foyer is not directly connected to the public street through the main lobby, an unobstructed corridor or passage shall be provided which leads to and equals the required minimum width of main entrances and exitways. A mirror shall not be placed so as to give an appearance as a doorway, exit or passageway.

**417.6.3 Gradient:** The rear foyer shall be at the same level as the back of the auditorium and the means of egress leading therefrom shall not have a steeper gradient than one (1) foot in eight (8) feet.

**417.6.4 Construction:** The partitions separating the foyer from the



auditorium and other adjoining rooms and spaces of theatres shall be constructed of not less than two (2) hour fire-resistance rating; except that opening protectives may be constructed of noncombustible materials without fire-resistance rating.

**417.6.5 Waiting spaces:** Waiting spaces for harboring occupants shall be located only on the first or auditorium floor. Separate exitways in addition to the required theatre exitways shall be provided from the waiting space based on an occupancy of one (1) person for each three (3) square feet of waiting space area.

#### **417.7 Theatre stage construction**

**417.7.1 Stage enclosure walls:** Every stage hereafter erected or altered for theatrical performances which is equipped with portable or fixed scenery, lights and mechanical appliances, shall be enclosed on all sides with solid walls of not less than four (4) hour fire-resistance rating, extending continuously from foundation to at least four (4) feet above the roof. There shall not be window openings in such walls within six (6) feet of an interior lot line; and all permissible window openings shall be protected with three-quarter (¾) hour fire windows complying with Article 9.

**417.7.2 Floor construction:** The entire stage, except that portion used for the working of scenery, traps, and other mechanical apparatus for the presentation of a scene, and the roof over the stage shall be not less than three (3) hour fire-resistance rated construction. All openings through the stage floor shall be equipped with tight fitting, solid wood trap doors not less than three (3) inches in thickness or other materials of equal physical and fire-resistance rated properties.

**417.7.3 Rigging loft:** The rigging loft, fly galleries and pin rails shall be constructed of approved noncombustible materials.

**417.7.4 Footlights and stage electrical equipment:** Footlights and border lights shall be installed in troughs constructed of non-combustible materials. The switchboard shall be so located as to be readily accessible at all times and the storage or placing of stage equipment against it shall be prohibited.

**417.7.5 Exterior doors:** All required exitway discharge door openings to the outer air shall be protected with approved self-closing fire doors, complying with Article 9. All exterior openings which are located on the stage for means of egress or loading and unloading purposes which are likely to be open during occupancy of the theatre, shall be constructed with vestibules to prevent air draughts into the auditorium.

**417.7.6 Proscenium wall:** There shall not be other openings in the wall separating the stage from the auditorium except the main proscenium opening; two (2) doorways at the stage level, one (1) on each side thereof; and, where necessary, not more than two (2) doorways to the

musicians' pit from the space below the stage floor. Each such doorway shall not exceed twenty-one (21) square feet in area and shall be protected with approved automatic and self-closing fire door assemblies complying with Article 9 with a combined fireresistance rating of three (3) hours or the approved labeled equivalent. The distance between the top of the proscenium opening and the ceiling of the stage shall be not less than five (5) feet.

**417.7.7 Proscenium curtain:** The proscenium opening shall be protected with an automatic fireresistive and smoke-tight curtain designed to resist an air pressure of not less than ten (10) pounds per square foot (psf) normal to its surface, both inward and outward. The curtain shall withstand a one-half ( $\frac{1}{2}$ ) hour fire test at a temperature of not less than seventeen hundred (1700) degrees F. without the passage of flame. The curtain shall be operated by an automatic heat activated device to descend instantly and safely and to completely close the proscenium opening at a rate of temperature rise of fifteen (15) to twenty (20) degrees F. per minute; and by an auxiliary operating device to permit prompt and immediate manual closing of the proscenium opening.

**417.7.8 Scenery:** All combustible materials used in sets and scenery shall be rendered flameresistant to comply with Article 9.

**417.7.9 Stage ventilation:** Metal or other approved noncombustible ventilators, equipped with movable shutters or sash shall be provided over the stage, constructed to open automatically and instantly by approved heat activated devices, with an aggregate clear area of opening not less than one-eighth ( $\frac{1}{8}$ ) the area of the stage, except as otherwise provided in Section 417.2.2. Supplemental means shall be provided for manual operation of the ventilator.

#### **417.8 Dressing and appurtenant rooms**

**417.8.1 Construction:** Dressing rooms, scene docks, property rooms, work shops and store rooms and all compartments appurtenant to the stage shall be of fireproof (Type 1) construction and shall be separated from the stage and all other parts of the building by walls of not less than three (3) hour fireresistance rating. Such rooms shall not be placed immediately over or under the operating stage area.

**417.8.2 Opening protectives:** Openings other than to trunk rooms and the necessary doorways at stage level shall not connect such rooms with the stage, and such openings shall be protected with one and one-half ( $1\frac{1}{2}$ ) hour self-closing fire doors or the approved labeled equivalent complying with Article 9.

**417.8.3 Dressing room and stage exitways:** Each tier of dressing rooms shall be provided with at least two (2) means of egress, one (1) of which shall lead directly to an exitway corridor, exitway discharge court or street. Exitway stairways from dressing and storage rooms may be unen-

closed in the stage area behind the proscenium wall. At least one (1) approved exitway shall be provided from each side of the stage and from each side of the space under the stage, and from each fly gallery and from the gridiron to a street, exitway discharge court or passageway to a street. An iron ladder shall be provided from the gridiron to a scuttle in the stage roof.

## **417.9 Lighting**

**417.9.1 Exitways:** During occupancy all exitways in places of assembly shall be lighted to comply with the requirements of Section 624.0.

**417.9.2 Auditoriums:** Aisles in auditoriums shall be provided with general illumination of not less than one-tenth ( $\frac{1}{10}$ ) foot candles at the front row of seats and not less than two-tenths ( $\frac{2}{10}$ ) foot candles at the last row of seats and the illumination shall be maintained throughout the showing of motion pictures or other projections.

**417.9.3 Other places of public assembly:** All areas and portions of buildings used as places of public assembly other than theatres shall be lighted by electric light to provide a general illumination of not less than one (1) foot candle.

**417.9.4 Control:** The lighting of exitways, aisles and auditoriums shall be controlled from a location inaccessible to unauthorized persons. Supplementary control shall be provided as specified in Section 408.3.4 in the motion picture projection room.

**417.10 Fire protection and fire fighting equipment:** Every theatre classified in the use group A-1 shall be equipped with a fire protection system complying with the requirements of Article 12 and as herein specified.

**417.10.1 Fire suppression system:** Approved automatic fire suppression systems complying with the provisions of Section 1202.0 shall be provided to protect all parts of the building except the auditorium, foyers and lobbies or in the immediate vicinity of automatic equipment or over dynamos and electric equipment. Such protection shall be provided over the stage, under the gridiron, under all fly galleries, in dressing rooms, over the proscenium opening on the stage side, under the stage, in all basements, cellars, work rooms, store rooms, property rooms and in toilet, lounge and smoking rooms.

**417.10.2 Standpipes:** Standpipe fire lines complying with the provisions of Section 1211.0 shall be provided with outlets and hose attachments; one (1) on each side of the auditorium in each tier; one (1) in each mezzanine; one (1) in each tier of dressing rooms; and protecting each property, store and work room.

**417.10.3 First-aid standpipes:** First-aid standpipes complying with the provisions of Section 1211.0 shall be provided on each side of the stage.

Such standpipes shall be not less than two and one-half (2½) inches in diameter, equipped with one and one-half (1½) inch hose and three-eighth (¾) inch nozzles.

**417.10.4 Hose outlets:** A sufficient quantity of hose shall be provided, equipped with regulation fire department couplings, nozzle and hose spanner, to reach all areas as specified in Article 12.

**417.10.5 First-aid hand equipment:** Approved portable two and one-half (2½) gallon fire extinguishers shall be provided and located as follows: two (2) on each tier or floor of the stage; one (1) immediately outside of the motion picture projection room; one (1) in each dressing room; and one (1) in each work, utility and storage room. Fire axes and fire hooks shall also be provided as directed by the fire official; and all fire extinguishers and fire tools shall be securely mounted on walls in plain view and readily accessible.

**SECTION 418.0 PUBLIC ASSEMBLY OTHER THAN THEATRES**

**418.1 General:** Other places of public assembly, including auditoriums, armories, bowling alleys, broadcasting studios, chapels, churches, community houses, dance halls, gymnasiums, lecture halls, museums, exhibition halls, night clubs, rinks, roof gardens and similar occupancies and uses shall comply with the general exitway requirements of Article 6 and the applicable requirements of Section 417.0, except the provisions of Sections 417.5.5 and 417.6.4 or as herein specifically exempted. Places of public assembly which are equipped with a stage, movable scenery, scenery loft and dressing rooms shall comply with all the requirements of Section 417.0, except use group A-1, theatres.

**418.2 Number of exitways:** Every tier, floor level and story of places of public assembly other than theatres, shall be provided with the number of required exitways as specified in Section 609.2, and of not less than the required width complying with Section 608.0 for the occupancy load. The required exitways shall be remote and independent of each other and located on opposite sides of the area served thereby.

**418.3 Aisles with fixed seats:** All rows of seats shall be individually fixed or fixed in rigid units between longitudinal aisles complying with

**Table 418**  
**MINIMUM EXITWAYS FOR OCCUPANCY LOADS**

Occupancy load per floor	Minimum number of exitways
Not more than 500 .....	2
501 to 900 .....	3
901 to 1800 .....	4
Over 1800 .....	5

Sections 417.4.2 and 417.5 except as provided for chapels and churches in Section 610.3. Where permitted, continuous fixed benches shall comply with the provisions of Section 420.0.

**418.4 Aisles without fixed seats:** Tables and chairs in all rooms and spaces for public assembly shall provide convenient access by unobstructed aisles not less than thirty-six (36) inches wide which lead to required exitways complying with Article 6.

**418.5 Bowling alleys:** The storage and use of all volatile flammable liquids shall comply with Section 402.0 and the finishing rooms shall be separately enclosed in two (2) hour fire-resistance rated construction with floor finish of concrete or other noncombustible, nonabsorbent material.

**418.6 Skating rinks:** Skating rinks shall not be located below the floor nearest grade.

### SECTION 419.0 AMUSEMENT PARKS

**419.1 Construction:** All accessory buildings and enclosed structures shall be constructed to conform to the requirements of this code governing use and occupancy as regulated by Tables 214 and 305 and in compliance with the fire limit restrictions of Article 3, except as may be specifically required in the following Sections 419.1.1 through 419.1.3.

**419.1.1 Amusement devices:** The maximum height of any amusement device in which passengers are transported shall not exceed forty (40) feet in frame (Type 4) construction; one hundred (100) feet in unprotected noncombustible (Type 2C) and heavy timber mill (Type 3A) construction; and shall not be limited in fireproof (Type 1) construction.

**419.1.2 Amusement park buildings:** All enclosed amusement park buildings over one (1) story in height shall be constructed or protected to furnish not less than one (1) hour fire-resistance rating; except where roof framing and decking are specifically permitted to be of non-combustible or mill type construction under the provisions of this code.

**419.1.3 Proximity to lot lines:** All structures located within twenty (20) feet of lot lines or within twenty (20) feet of other structures on the same lot shall be of protected noncombustible (Type 2B) or protected masonry enclosed (Type 3A or 3B) construction or better.

**419.2 Walkways and ramps:** Walkways and ramps shall be erected with a slope not greater than one (1) in ten (10), except that when approved nonslip surfaces are provided, the grade may be increased to a maximum of one (1) in eight (8).

**419.3 Elevating and conveying equipment:** The equipment and operation of all devices and mechanisms for transporting persons shall comply with the requirements of Article 16.

**419.4 Tests:** All amusement devices used by the public which involve hazardous features shall be installed and operated as directed by the building official and shall not be placed in service until acceptance tests have been made and the installation has been approved by him.

**419.5 Fire protection:** In addition to the fire extinguisher and fire fighting equipment required by the use and occupancy of each building and structure under the provisions of this code, every amusement and exhibition park, when required by the building official, shall be provided with a system of fire hydrants and fire lines with the required water supply, complying with Article 12 and the standards listed in Appendix I for yard systems.

## **SECTION 420.0 STADIUMS AND GRANDSTANDS**

**420.1 General:** Stadiums and grandstands shall be constructed as required by this code and in accordance with the approved rules and the Standard for Tents, Grandstands and Air-Supported Structures Used for Places of Assembly (NFPA 102) listed in Appendix B.

**420.2 Handrails:** Means of egress stairways shall be provided with a handrail on at least one (1) side. The handrail may be broken as necessary to provide for entrance to the seating platforms.

**420.3 Spaces underneath seats:** Spaces underneath grandstand seats shall be kept free of all combustible and flammable materials and shall not be occupied or used for other than exitways; except that when enclosed in not less than one (1) hour fire resistance rated construction, the building official may approve the use of such spaces for other purposes that do not endanger the safety to public.

## **SECTION 421.0 DRIVE-IN MOTION PICTURE THEATRES**

**421.1 Location:** The location of drive-in motion picture theatres shall be approved by the local or state authority having jurisdiction over highways and streets.

**421.2 Arrangement of lanes:** Separate entrance and exit lanes shall be provided not less than twelve (12) feet in width, with not less than forty (40) foot intervals between access lanes. The parking space for each car shall not be less than nine (9) feet by twenty (20) feet in area, and so arranged to provide continuous lanes of travel.

**421.3 Projection booth:** The projection booth shall comply with Section 408.3 and shall be supported on a structure of Type 2C or other approved noncombustible construction. A motor vehicle shall not be permitted to park within twenty (20) feet of the projection booth or room.

**421.4 Toilet facilities:** Separate toilet facilities shall be provided for each sex as required in the plumbing code for places of public assembly.

**421.5 Fire protection:** Sufficient approved portable fire extinguishers shall be provided in readily accessible locations, plainly and visibly identified by signs, at distances of not more than one hundred and fifty (150) feet so as to be available to every motor vehicle as directed by the fire official. The fire extinguishers shall be mounted on posts or platforms protected from mechanical injury with substantial guards as approved by the building official.

## **SECTION 422.0 TENTS, AIR-SUPPORTED STRUCTURES AND OTHER TEMPORARY STRUCTURES**

**422.1 Construction:** Tents and air-supported structures shall be constructed as required by this code and the approved rules.

**422.2 Permits:** A special temporary permit shall be secured from the building official for all such installations. Tents, air-supported structures and other temporary structures may be erected for a period not exceeding ninety (90) days for religious, educational, recreational, or similar purposes.

**422.3 Location:** Tents and air-supported structures shall be located outside the fire limits unless an accessible unoccupied open space is provided around the perimeter with a minimum width of fifty (50) feet.

**422.4 Approved type:** Tents, air-supported structures and other temporary structures shall be of an approved type. The applicant for a special temporary permit hereunder shall submit evidence of the adequacy of the temporary structure in accordance with the requirements of Section 108.5 of this code.

### **422.5 Fire prevention**

**422.5.1 Combustible materials:** Combustible materials shall not be permitted under stands or seats at any time.

**422.5.2 Combustible trash:** The area within and adjacent to tents, air supported structures or other temporary structures shall be maintained clear of all grass or underbrush creating a fire hazard within a radius of fifty (50) feet; and all combustible trash shall be removed from the structure after each performance.

## **SECTION 423.0 PARKING LOTS**

**423.1 Curb cuts:** Parking lots shall be arranged to afford ready means of entrance and exit at sidewalk level; and special permits shall be secured for curb cuts from the administrative authorities.

**423.2 Lanes and parking spaces:** Access lanes not less than twelve (12) feet in width shall be provided for each row of cars; and the parking space shall be not less than eight (8) feet by eighteen (18) feet in area for each motor vehicle.



**423.3 Parking lot offices:** The construction of parking lot offices shall comply with the fire limit restrictions of Section 302.0.

**423.4 Protection of adjoining property:** A substantial bumper of masonry, steel or heavy timber shall be placed near all interior lot lines to protect structures and property abutting the parking lot.

**423.5 Surface and drainage:** Parking lots shall be graded with rolled or compacted cinders, gravel or other approved nonabsorbent materials to prevent raising of dust and shall be maintained to prevent drainage onto adjoining property or the sidewalk.

**423.6 Electric illumination:** Electric light wiring shall be provided on approved standards to furnish adequate illumination of driveways and lanes as required by the jurisdiction authorities for street lighting, but such illumination shall not be less than one-quarter ( $\frac{1}{4}$ ) of one (1) lumen per square foot of parking area.

## SECTION 424.0 MOBILE UNITS

**424.1 General:** Mobile units, as defined in Section 201.0, shall be designed, constructed and maintained to be transported from one location to another and not mounted on a permanent foundation. A mobile unit placed on a permanent foundation or on foundation piers shall be designed and constructed to comply with all of the requirements of this code for at-site and prefabricated construction.

**424.2 Construction:** Residential mobile units shall be of an approved design and constructed in accordance with the applicable ordinances and statutes. All other mobile units shall be designed and constructed in accordance with the requirements of this code. All mobile units on a permanent foundation shall be evaluated, inspected and labeled in-plant in accordance with Section 1803.0.

**424.3 Location:** Mobile units shall be located in spaces approved for such use. The provision of this code shall not be construed to repeal, modify or constitute an alternative to any lawful zoning regulations. In case of conflict between this code or any other ordinance or statute, the most rigid requirements shall apply.

**424.3.1 Anchorage and tie-down:** Every parking space for mobile units shall be provided with devices for anchoring the unit to prevent overturning or uplift. The owner of the parking space shall anchor or cause to be anchored all mobile units located on the parking space. Where concrete platforms are provided for the parking of the units, anchorage may be by eyelets imbedded in the concrete with adequate anchor plates or hooks; or other suitable means. The anchorage shall be adequate to withstand wind forces and uplift as required in Article 7 for buildings and structures, based upon the size and weight of the units.



**SECTION 425.0 MOTELS**

**425.1 General:** All buildings and accessory structures used as motels shall comply with the requirements and limitations of this code for the occupancy and use for which they are designed and as herein specifically required.

**425.2 Garages:** Garages when attached to motel residential buildings shall have the interior faces of all walls, when not of approved masonry construction, and the ceilings protected to afford one (1) hour fire-resistance rating and all connecting openings shall be protected with approved three-quarter ( $\frac{3}{4}$ ) hour fire doors or their equivalent complying with Article 9, or with one and three-quarter ( $1\frac{3}{4}$ ) inch solid core wood doors. Roofed-over passageways may be used to connect garages to dwellings if protected with one (1) hour fire-resistance rated construction.

**425.3 Required exitways:** All exitways in buildings more than one (1) story in height shall be constructed of one (1) hour fire-resistance rating and all stories above the first shall have at least two (2) means of egress complying with Article 6. All exitways from residential quarters shall lead to open spaces not less than twenty (20) feet in width which provide direct access to public streets or highways.

**425.4 Driveways and parking spaces:** The arrangement and capacity of driveways, lanes and parking spaces shall comply with the requirements specified for parking lots in Section 423.0.

**425.5 Water supply and sanitary facilities:** Fresh water supply for drinking and domestic purposes and all sanitary facilities shall comply with the provisions of the plumbing code.

**SECTION 426.0 RADIO AND TELEVISION TOWERS**

**426.1 General:** Subject to the structural provisions of Section 715.0 for wind loads and the requirements of Section 925.0 governing the fire-resistance ratings of buildings for the support of roof structures, all radio and television towers shall be designed and constructed as herein provided.

**426.2 Location and access:** The towers shall be so located and equipped with step bolts and ladders to be readily accessible for inspection purposes. Guy wires or other accessories shall not cross or encroach upon any street or other public space, or over any electric power lines, or encroach upon any other privately owned property without written consent of the owner.

**426.3 Construction:** All towers shall be constructed of approved corrosion-resistive noncombustible materials. Within the limitations of Section 302.0 for fire limits, isolated radio towers may be constructed of lumber sizes qualifying for mill type construction when not more than one hundred (100) feet in height.

**426.4 Loads:** The structure shall be securely braced and anchored to resist a wind of not less than thirty (30) pounds per square foot (psf) on the net area of both sides of latticed construction and on the projected area of the antennae plus the wind on ice-covered sections in localities where subject to freezing temperatures. Where subject to winds of unusual velocity, the loads shall be increased accordingly. Due allowance shall be made for effect of shape of individual elements and contour of the tower as provided in Section 715.4 in computing wind loads.

**426.4.1 Dead load:** Antennae and towers shall be designed for the dead load plus ice load in regions where ice formation is likely to occur.

**426.4.2 Uplift:** Adequate foundations and anchorage shall be provided to resist two (2) times the calculated wind uplift.

**426.5 Grounding:** All towers shall be permanently and effectively grounded.

### SECTION 427.0 RADIO AND TELEVISION ANTENNAE

**427.1 Permits not required:** Antennae structures for private radio or television reception not more than twelve (12) feet in height may be erected and maintained on the roof of any building without a building permit. Such a structure, however, shall not be erected so as to injure the roof covering and when removed from the roof, the roof covering shall be repaired to maintain weather and water tightness. The installation shall not be erected nearer to the lot line than the total height of the antennae structure, nor shall such structure be installed near electric power lines or encroach upon any street or other public space.

**427.2 Permits required:** The approval of the building official shall be secured for all antennae structures more than twelve (12) feet in height. The application shall be accompanied by detailed drawings of the structure and methods of anchorage. All connections to the roof structure must be properly flashed to maintain water tightness. The design and materials of construction shall comply with the requirements of Section 426.3 for character, quality, and minimum dimensions.

### SECTION 428.0 SWIMMING POOLS

**428.1 General:** Pools used for swimming or bathing shall be in conformity with the requirements of this section, provided, however, these regulations shall not be applicable to any such pool less than twenty-four (24) inches deep or having a surface area less than two-hundred and fifty (250) square feet, except when such pools are permanently equipped with a water recirculating system or involve structural materials. For purposes of this code, pools are classified as private swimming pools or public and semi-public swimming pools, as defined in Section 428.2.

Materials and constructions used in swimming pools shall comply with

the applicable requirements of this code. Pools used for swimming or bathing and their equipment or accessories which are constructed, installed and maintained in accordance with the applicable standards listed in Appendix B, shall be deemed to conform to the requirements of this code, provided the requirements of Section 428.8 are included in the installation.

**428.2 Classification of pools:** Any constructed pool which is used, or intended to be used, as a swimming pool in connection with a single family residence and available only to the family of the householder and his private guests shall be classified as a private swimming pool. Any swimming pool other than a private swimming pool shall be classified as a public or semi-public swimming pool.

### **428.3 Plans and permits**

**428.3.1 Permits:** A swimming pool or appurtenances thereto shall not be constructed, installed, enlarged or altered until a permit has been obtained from the building official. The approval of all city, county and state authorities having jurisdiction over swimming pools shall be obtained before applying to the building official for a permit. Certified copies of these approvals shall be filed as part of the supporting data for the application for the permit.

**428.3.2 Plans:** Plans shall accurately show dimensions and construction of pool and appurtenances and properly established distances to lot lines, buildings, walks and fences; details of water supply system, drainage and water disposal systems, and all appurtenances pertaining to the swimming pool. Detail plans of structures, vertical elevations, and sections through the pool showing depth shall be included.

**428.4 Locations:** Private swimming pools shall not encroach on any front or side yard required by this code, or the governing zoning law, except by specific rules of the jurisdiction in which it may be located. A wall of a swimming pool shall not be located less than six (6) feet from any rear or side property line or ten (10) feet from any street property line, except by specific rules of the jurisdiction in which it may be located.

### **428.5 Design and construction**

**428.5.1 Structural design:** The pool structure shall be engineered and designed to withstand the expected forces to which it will be subjected.

**428.5.2 Wall slopes:** To a depth up to five (5) feet from the top, the wall slope shall not be more than two (2) feet horizontal in five (5) feet vertical.

**428.5.3 Floor slopes:** The slope of the floor on the shallow side of transition point shall not exceed one (1) foot vertical to seven (7) feet horizontal. The transition point between shallow and deep water shall not be more than five (5) feet deep.

**428.5.4 Surface cleaning:** All swimming pools shall be provided with a recirculating skimming device or overflow gutters to remove scum and foreign matter from the surface of the water. Where skimmers are used there shall be at least one (1) skimming device for each one thousand (1,000) square feet of surface area or fraction thereof. Where overflow gutters are used they shall be not less than three (3) inches deep, pitched one-quarter ( $\frac{1}{4}$ ) inch per foot to drains, and constructed so they are safe, cleanable and that matter entering the gutters will not be washed out by a sudden surge of entering water.

**428.5.5 Walkways:** All public or semi-public swimming pools shall have walkways not less than four (4) feet in width extending entirely around the pool. Where curbs or sidewalks are used around any swimming pool they shall have a non-slip surface for a width of not less than one (1) foot at the edge of the pool and shall be so arranged to prevent return of surface water to the pool.

**428.5.6 Steps and ladders:** One (1) or more means of egress shall be provided from the pool. Treads of steps or ladders shall have non-slip surfaces and handrails on both sides, except that handrails may be omitted when there are not more than four (4) steps or when they extend the full width of the side or end of the pool.

## **428.6 Water supply, treatment and drainage systems**

**428.6.1 Water supply:** All swimming pools shall be provided with a potable water supply, free of cross-connections with the pool or its equipment.

**428.6.2 Water treatment:** Public and semi-public swimming pools shall be designed and installed so that there is a pool water turnover at least once every eight (8) hours. Filters shall not filter water at a rate in excess of three (3) gallons per minute per square foot of surface area. The treatment system shall be so designed and installed to provide in the water, at all times when the pool is in use, excess chlorine of not less than four-tenths (0.4) parts per million (ppm) or more than six-tenths (0.6) ppm, or excess chloramine between seven-tenths (0.7) and one (1.0) ppm, or disinfection may be provided by other approved means. Acidity-alkalinity of the pool water shall not be below seven (7.0) or more than seven and one-half (7.5). All recirculation systems shall be provided with an approved hair and lint strainer installed in the system ahead of the pump.

Private swimming pools shall be designed and installed so that there is a pool water turnover at least once every eighteen (18) hours. Filters shall not filter water at a rate in excess of five (5) gallons per minute per square foot of surface area. The pool owner shall be instructed in proper care and maintenance of the pool, by the supplier or builder, including the use of high test calcium hypochlorite (dry chlorine) or sodium hypochlorite (liquid chlorine) or equally effective germicide and algacide and the importance of proper pH (alkalinity and acidity) control.

**428.6.3 Drainage systems:** The swimming pool and equipment shall be equipped to be completely emptied of water and the discharged water shall be disposed of in an approved manner that will not create a nuisance to adjoining property.

#### **428.7 Appurtenant structures and accessories**

**428.7.1 Appurtenant structures:** All appurtenant structures, installations, and equipment, such as showers, dressing rooms, equipment houses or other buildings and structures, including plumbing, heating, and air conditioning, amongst others appurtenant to a swimming pool, shall comply with all applicable requirements of this code and the zoning law.

**428.7.2 Accessories:** All swimming pool accessories shall be designed, constructed, and installed so as not to be a safety hazard. Installations or structures for diving purposes shall be properly anchored to insure stability, and properly designed and located for maximum safety.

#### **428.8 Safety precautions**

**428.8.1 Equipment installations:** Pumps, filters, and other mechanical and electrical equipment for public and semi-public swimming pools shall be enclosed in such a manner as to be accessible only to authorized persons and not to bathers. Construction and drainage shall be such as to avoid the entrance and accumulation of water in the vicinity of electrical equipment.

**428.8.2 Swimming pool safety devices:** Every person owning land on which there is situated a swimming pool, which contains twenty-four (24) inches or more of water in depth at any point, shall erect and maintain thereon an adequate enclosure either surrounding the property or pool area, sufficient to make such body of water inaccessible to small children. Such enclosure, including gates therein, must be not less than four (4) feet above the underlying ground; all gates must be self-latching with latches placed four (4) feet above the underlying ground or otherwise made inaccessible from the outside to small children.

A natural barrier, hedge, pool cover or other protective device approved by the governing body may be used so long as the degree of protection afforded by the substituted devices or structures is not less than the protection afforded by the enclosure, gate and latch described herein.

### **SECTION 429.0 OPEN PARKING STRUCTURES**

**429.1 General:** Open passenger vehicle parking structures are those structures used for the parking or storage of passenger motor vehicles designed to carry not more than nine (9) persons, and include the following two (2) general types.

1. Ramp type parking structures are those employing a series of con-

tinuously rising floors or a series of interconnecting ramps between floors permitting the movement of passenger automobiles under their own power to and from the street level.

2. Mechanical type parking structures are those employing specially designed parking machines, elevators, lifts, conveyors, moving cranes, dollies or other devices for moving passenger automobiles to and from the street level.

For exitway requirements see Section 609.5.

**429.2 General construction requirements:** Passenger vehicle structures shall be constructed of noncombustible materials throughout, including structural framing, floors, roofs and walls. Any enclosed rooms or spaces on the premises shall comply with the applicable requirements of this code.

**429.3 Separations:** Parking structures may be erected without exterior walls except that an enclosure wall with not less than two (2) hours fire-resistance rating, without openings therein, shall be provided when located within six (6) feet of interior lot lines.

**429.4 Basements:** Basements, if used for parking of vehicles, shall be sprinklered in accordance with the provision of Section 1202.0 and shall be ventilated in accordance with the provisions of Section 414.3.1.

**429.5 Gasoline dispensing:** Areas used for dispensing of gasoline in parking structures shall be located on the grade floor and shall comply with the requirements of Section 415.0.

**429.6 Heights and areas:** Heights and areas of open parking structures shall not exceed the limits specified in the following Table 429.

Table 429  
HEIGHT AND AREA LIMITATION FOR OPEN PARKING STRUCTURES

Type of construction	Height	Area in square feet
1A & 1B	Unlimited	Unlimited
2A	12 Stories—120 feet	Unlimited
2B	10 Stories—100 feet	50,000
2C	8 Stories— 85 feet	30,000
2B & 2C	2 Stories— 25 feet <sup>1</sup>	Unlimited

**Note 1.** Type 2B and 2C construction may be six (6) stories in height and unlimited in area when at least fifty (50) per cent open on all sides and when the horizontal distance from any point on any level to an exterior wall opening on a street, alley, courtyard or any other permanent open space does not exceed two hundred (200) feet.

The areas of structures wherein more than twenty-five (25) per cent of the perimeter has frontage on street or other open space leading to a street each of which is not less than thirty (30) feet wide may be increased as provided in Section 306.2. When an automatic sprinkler system is installed in accordance with Section 1204.0 in Types 2B and 2C

construction, the area may be unlimited. The above limits of height permit parking on the roof.

**429.7 Protective guard rails:** All wells, shafts and other open, exposed spaces throughout, except first floor, shall be enclosed and protected with continuous walls or protective guard rails at least three (3) feet six (6) inches in height, except that in those structures wherein vehicles are hoisted to the desired level and placed in the parking space entirely by approved mechanical means, the three (3) foot six (6) inch high continuous wall or protective guard rail may be omitted on the side of the parking levels adjacent to the space occupied by the hoisting and placing equipment.

**429.8 Wheel guards:** Wheel guards made of noncombustible material shall be placed wherever required.

### SECTION 430.0 FALLOUT SHELTERS

**430.1 General:** This article shall establish the minimum criteria which must be met before a building or building space can be constructed, occupied, used, or designated as a fallout shelter, and such shelters must be constructed in accordance with the applicable standards as listed in Appendix B.

### SECTION 431.0 HIGH-RISE BUILDINGS

**431.1 Applicability:** The provisions of this section shall apply to all buildings of the following use groups when such buildings have floors used for human occupancy located more than six (6) stories or seventy-five (75) feet above the lowest level of fire department vehicle access:

1. use group B (business),
2. use group R-1 (residential, hotel), and
3. use group R-2 (residential multi-family).

**431.2 Maintenance and inspection:** All fire protection systems shall be maintained in an operative condition at all times and shall be periodically inspected and tested in accordance with the fire prevention code listed in Appendix B. Maintenance inspections shall be made quarterly and logged in a journal kept available for inspection.

**431.3 Options:** All buildings and structures shall be provided with either an approved automatic fire suppression system or safe areas of refuge (compartmentation) in accordance with the following.

**431.3.1 Automatic fire suppression system:** When provided as required herein, the automatic fire suppression system shall be installed throughout the building. The system shall be designed using the parameters set forth in the applicable standards listed in Appendix I and the following:



1. Shutoff valves and a water flow device shall be provided for each floor.
2. In Seismic Zones 2 and 3, each system shall be supplied by two (2) or more risers. An approved check valve shall be provided at each point of connection of the sprinkler system to the riser in such a manner that one (1) of the interconnected risers can remain operational if a break occurs in the other riser.
3. In addition to the main water supply, in Seismic Zones 2 and 3, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus one hundred (100) gallons per minute additional for the total standpipe system shall be provided. This supply shall be automatically available if the principal supply fails and shall have a duration of thirty (30) minutes.

**431.3.1.1 Automatic fire suppression system alternatives:** When a fire suppression system is installed, modifications to this code are permitted as described below.

1. The type of construction required by this code may be modified as follows:

Type of construction set forth in Table 214	Modified type of construction permitted hereunder
1A	1B
1B	2A
2A	2B

2. The fireresistance rating of exitway access corridors and vertical separation of tenant spaces shall:
  - a. not be required in use group B (business) buildings;
  - b. be a minimum of one-half ( $\frac{1}{2}$ ) hour in use group R-1 (residential, hotel) and R-2 (residential, multi-family) buildings; and the wall or partitions may be terminated at the lowest portion of the fireresistance rated assembly above.
3. Vertical shafts other than stairway enclosures and elevator hoistway enclosures may be reduced to one (1) hour when sprinklers are installed within the shafts at alternate floors.
4. The exitway access and common corridor doors need not meet the requirements of Section 610.4 except they shall be self-closing and tight fitting.
5. The one and one-half ( $1\frac{1}{2}$ ) inch hose line, nozzle, rack and cabinet may be omitted as set forth in Section 1211.5.1.
6. The exitway access travel distance set forth in Table 607 may be increased to three hundred (300) feet.



7. Smokeproof enclosures as set forth in Section 618.0 may be omitted, but required stairways shall be pressurized to fifteen-hundredths (0.15) inches of water column in the manner described in Section 618.9.3.
8. Spandrel walls, eyebrows and compartmentation are not required; however, the fire resistance rating of the floors and junctures of exterior walls with each floor must be maintained.
9. Fire dampers, other than those needed to maintain the fire resistance rating of the floor-ceiling assembly, are not required. Where fire dampers will interfere with the operation of the smoke control system approved alternate protective devices shall be utilized.
10. Operable windows required by Section 609.4 for emergency egress or rescue may be omitted.

**431.3.2 Areas of refuge (compartmentation):** Areas of refuge conforming to the following may be provided as an alternate to the automatic fire suppression systems.

1. Every story shall be divided into two (2) or more areas of approximately the same size with no single area exceeding fifteen thousand (15,000) square feet. The wall and doors between the areas of refuge shall be constructed as required for a horizontal exit in Section 614.0.
2. Each area of refuge (compartment) shall contain a minimum of one (1) enclosed exitway stairway and each compartment shall have access to an elevator which may serve additional compartments. When elevators are directly accessible to more than one (1) compartment, the elevator lobby shall be separated from the compartments by not less than two (2) hour fire resistance rated construction with tight fitting opening protectives having fire resistance ratings of not less than one and one-half (1½) hour.
3. Openings in exterior walls, where such openings are within five (5) feet of each other horizontally on adjacent floors or located vertically above one another, shall be protected by approved flame barriers either extending thirty (30) inches beyond the exterior wall in the plane of the floor or by approved vertical panels complying with Section 906.3.1.
4. Walls used for compartmenting a building shall have a fire resistance rating of not less than two (2) hours. Duct penetrations of this wall shall not be permitted. Ferrous or copper piping and conduit may penetrate or pass through the wall only if the openings around such piping and conduit are sealed with impervious non-combustible materials sufficiently tight to prevent the transfer of smoke or combustion gases from one (1) side of the wall to the other and are so maintained. The fire door serving as the horizontal

exit between compartments shall be so installed, fitted and gasketed that it will provide a substantial barrier to the passage of smoke and shall comply with Section 614.2.1.

5. The fireresistive floor or the floor/ceiling construction shall extend to and be tight against the exterior wall so that the fireresistive integrity between stories is maintained. No penetrations or other installations which will impair the fireresistive integrity of the floor or floor/ceiling assembly shall be permitted (see Section 903.1.).
6. A manual fire alarm system (pull boxes) shall be provided.

**431.4 Smoke detection systems:** An approved smoke detector suitable for the intended use shall be installed in:

1. every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room unless such rooms are protected with an automatic fire suppression system, and
2. each connection to a vertical duct or riser serving two (2) or more stories from return air ducts or plenums of heating, ventilating and air conditioning systems, except that in use group R (residential) occupancies, an approved smoke detector may be used in each return air riser carrying not more than five thousand (5,000) cfm and serving not more than ten (10) air inlet openings.

The actuation of any detector required by this section shall operate the voice alarm system and shall place into operation all equipment necessary to prevent the recirculation of smoke.

**431.5 Alarm and communication systems:** Alarm and communication systems shall be provided. The alarm and communication systems shall be so designed and installed that damage to any terminal unit or speaker will not render more than one (1) zone of the system inoperative.

A single communication system may be designed to serve the voice alarm, public address and fire department communication system as follows:

1. **Voice alarm system:** The operation of any smoke detection, sprinkler waterflow device or manual fire alarm station shall automatically activate a voice alarm system. Activation of the system shall automatically sound an alert signal to the desired areas. The voice alarm system shall provide a predetermined message on a selective basis to the area where the alarm originated and shall provide information and give direction to the occupants. The alarm shall be designed to be heard clearly by all occupants within the building or designated portions thereof as is required for the public address system.

The central control station shall contain controls for the voice

alarm system so that a selective or general voice alarm may be manually initiated.

The system shall be continuously electrically supervised against component failure of the audiopath including amplifiers, speaker wiring, switches and electrical contacts and shall detect opens, shorts and grounds which might impair the function of the system.

2. **Public address system:** A public address communication system designed to be clearly heard by all occupants of the building shall operate from the central control station. It shall be established on a selective or general basis to the following terminal areas:
  - a. elevators,
  - b. elevator lobbies,
  - c. corridors,
  - d. exitway stairways,
  - e. rooms and tenant spaces exceeding one thousand (1,000) square feet in area,
  - f. dwelling units in apartment houses, and
  - g. hotel guest rooms or suites.
3. **Fire department communication system:** A two (2) way fire department communication system shall be provided for fire department use. It shall operate between the central control station and every elevator, elevator lobby and entry to every enclosed exitway stairway.

**431.6 Central control station:** A central control station for fire department operations shall be provided in a location approved by the fire department. It shall contain:

1. the voice alarm and public address system panels;
2. the fire department communications panel;
3. fire detection and alarm system annunciator panels;
4. status indicator for elevators;
5. status indicators and controls for air handling systems;
6. controls for unlocking all stairway doors simultaneously;
7. sprinkler valve and waterflow detector display panels;
8. emergency power, light and emergency system controls and status indicators; and
9. a telephone for fire department use with controlled access to the public telephone system.

**431.7 Smoke control:** Natural or mechanical ventilation for the removal of products of combustion shall be provided in every story and shall consist of one (1) of the following:

1. Panels or windows in the exterior walls which can be opened remotely from an approved location other than the fire floor. Such

venting facilities shall be provided at the rate of twenty (20) square feet per fifty (50) lineal feet of exterior wall in each story and shall be distributed around the perimeter at not more than fifty (50) foot intervals. Such windows or panels and their controls shall be clearly identified.

**Exception:** When a complete automatic fire suppression system is installed, windows or panels manually openable from within the fire floor or approved fixed tempered glass may be used in lieu of the remotely operated openable panels and windows. Such windows shall be clearly identified and shall be of the size and spacing called for above.

2. When a complete and approved automatic fire suppression system is installed, the mechanical air handling equipment may be designed to accomplish smoke removal. Under fire conditions, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building. The air handling system shall provide a minimum of one (1) exhaust air change each ten (10) minutes for the area involved.
3. Any other approved design which will adequately remove smoke from each compartment served in an unsprinklered building provided the system is tested and approved by the building official before the building is certified for occupancy.

**431.8 Elevators:** Elevator operation and installation shall be in accordance with Article 16, the standards listed in Appendix B and the following:

1. At least one (1) elevator shall be provided for fire department emergency access to all floors. In compartmented buildings the elevator shall be located in a smokeproof enclosure; or shall open into a lobby (which may serve additional elevators) separated from the remainder of the building by one (1) hour fire resistance rated construction. Elevator operation shall be in accordance with the Safety Code for Elevators listed in Appendix B; said elevator cab shall be of such size as to accommodate an ambulance cot in its horizontal open position.
2. Each elevator call station shall have an illuminated sign which flashes on and off to show the words *Emergency—Use the Exit Stairs* when an elevator lobby smoke detector is activated. The words shall be not less than one-half ( $\frac{1}{2}$ ) inch block letters.

**431.9 Emergency power, light and emergency systems:** Emergency power, light and emergency systems shall comply with the following:

1. **Emergency power:** A permanently installed on-site power generation system shall be provided. All power, lighting, signal and communication facilities provided under the requirements of this sec-

tion, including an independent ventilation system for the emergency power generator room, shall be transferable to the emergency power source.

The electrical power requirements for sizing the emergency power generation systems shall include but not be limited to the following:

- a. fire protection equipment, including fire pumps;
  - b. mechanical ventilation equipment required by this section including power operated windows;
  - c. elevator cars required by Section 1607.2;
  - d. emergency lighting; and
  - e. the normal loads of all facilities classed as emergency. The regular light and power circuits supplying such facilities are classified as emergency systems and shall be automatically transferable to the emergency power generation system.
2. **Emergency lighting:** Emergency lighting shall include but not be limited to the following:
- a. separate lighting circuits and facilities sufficient to provide light with an intensity not less than one (1) foot candle measured at floor level in all exitway access corridors, stairways, smokeproof enclosures, elevators, elevator lobbies, and other areas which are clearly part of the means of egress; and
  - b. all circuits supplying lighting for the central control station, the emergency power generator rooms, and other rooms housing control equipment for mechanical systems required by this section shall be transferable to the emergency power system.
3. **Emergency systems:** All electrical systems and facilities required by this section and classified as emergency shall be installed in an approved manner. The following systems and lighting loads are classified as emergency facilities and shall operate within ten (10) seconds of primary power failure:
- a. required lighted exit signs and exit pathway illumination,
  - b. fire alarm and sprinkler alarm systems,
  - c. fire detection systems,
  - d. elevator car lighting,
  - e. stairway door control systems, and
  - f. voice communication systems.

**431.10 Exits:** Exits shall comply with other requirements of this code and the following:

1. All stairway doors which are to be locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central control station.
2. A telephone or other two-way communications system connected to

an approved emergency service which operates continuously shall be provided at not less than every fifth (5) floor in each required stairway where other provisions of this code permit the doors to be locked.

3. Smokeproof enclosures may be eliminated if all enclosed stairways are pressurized, as provided for mechanically operated smokeproof enclosures, to a minimum of fifteen-hundredths (0.15) and a maximum of thirty-five hundredths (0.35) inch of water column in fully sprinklered buildings.

**431.11 Seismic consideration:** In Seismic Zones 2 and 3, the anchorage of the following mechanical and electrical equipment shall be designed in accordance with Appendix L-101.0 for a lateral force based on  $C_p$  value of five-tenths (0.5) unless data approved by the building official substantiating a lesser value is furnished:

1. elevator drive and suspension systems,
2. emergency power and lighting facilities,
3. fire pumps and all other fire protection equipment and systems.

## SECTION 432.0 COVERED MALLS

**432.1 Scope:** Covered mall buildings are subject to the special requirements of this section and are of two (2) types:

1. Type A covered mall buildings are subject to the general provisions of this code.
2. Type B covered mall buildings may be designed and constructed in accordance with the special provisions as noted herein. All other applicable provisions not specified herein shall be complied with.

### 432.2 Requirements for Type B covered mall buildings

**432.2.1 Lease plan:** The permit holder shall provide both the building and fire departments with a lease plan showing the locations of each occupancy and its means of egress after the certificate of occupancy has been issued. Such plans shall be kept current. No modifications or changes in occupancy or use shall be made from that shown on the lease plan without prior approval of the building official.

**432.2.2 Tenant separations:** Each tenant shall be separated from adjoining tenants by a wall having a minimum one (1) hour fire-resistance rating which shall extend from the floor to the underside of the ceiling. No separation is required between a tenant space and a mall.

**432.2.3 Exitways:** Exitways shall be provided in accordance with the following:

1. The maximum length of exitway access travel from any point within

the mall to an approved exitway along the natural and unobstructed path of travel shall not exceed two hundred (200) feet.

2. Each individual occupancy within the covered mall building shall be provided with a means of egress in accordance with other provisions of this code. Measurements may be made to the entrance to the mall.
3. When the length of travel from the most remote point within a tenant space exceeds one hundred (100) feet to the mall, a second means of egress shall be provided. When two (2) or more means of egress are required, the secondary exits may open into the mall, an exit corridor, an exit enclosure, or to the exterior. When a corridor provides the second means of egress, it shall be of one (1) hour fireresistance rated construction and doors to the corridors shall be one (1) hour opening protectives. Such doors shall be self closing, and be so maintained, or shall be automatic closing when actuated by smoke detectors.
4. Anchor stores shall provide the required number of exitways and units of exit width directly to the exterior. The occupant load of anchor stores opening into the mall shall not be included in determining exitway requirements for the mall.
5. The dead end of a mall shall not exceed twice its width.
6. In determining required exitway facilities of the mall, the number of occupants for whom exitway facilities are to be provided, shall be based on gross leasable area of the covered mall building (including anchor stores) and shall be based on the following table.

Square feet per person	Gross leasable area (sq. ft.)
30	under 300,000
40	300,000-700,000
50	over 700,000

7. The minimum width of exitway access passageways and corridors from a mall shall be fifty-six (56) inches.
8. The required units of exit width and exitways shall be distributed equally throughout the mall.
9. Storage is prohibited in exitway corridors which are also used for service to the tenants. Such corridors shall be posted with conspicuous signs so stating.

**432.2.4 Mall width:** The minimum width of the mall shall be twenty (20) feet.

There shall be a minimum of ten (10) feet clear exitway width to a height of eight (8) feet between any projection of a tenant space border-



ing the mall and the nearest kiosk, vending machine, bench, display opening, or other obstruction to egress travel.

The mall width shall be sufficient to accommodate the occupancy load emptying into the immediately adjacent mall as determined by Section 432.2.3 for all occupancies except assembly which shall be determined by Section 606.0.

#### 432.2.5 Type of construction

1. The structural elements of the covered mall building shall be of noncombustible (Types 1 and 2) or heavy timber (Type 3A) construction.
2. Floor/ceiling assemblies and their supporting columns and beams within multi-level covered malls shall be of one (1) hour fire-resistance rated noncombustible construction.
3. Separation between tenant spaces and the mall is not required. When walls are provided, they shall comply with the provisions of Table 214 for other non-bearing partitions.

**432.2.6 Roof coverings:** Roof coverings for covered mall buildings shall be Class A, B, or C as required by Section 926.0.

**432.2.7 Mixed occupancy:** Use groups assembly (A), business (B), mercantile (M), and residential (R) may be accessory to the covered mall building. Accessory occupancies may be three (3) times the area permitted by Table 305 for the type of construction and the occupancy involved. Use groups assembly (A), business (B), mercantile (M) and residential (R) shall be separated from adjacent tenants by a minimum of one (1) hour fire-resistance rated separation wall.

**Exception:** Assembly (A) occupancies shall be located in the covered mall building so that their main entrance is immediately adjacent to a principle entrance to the mall.

The sprinkler system required in covered mall buildings shall not be substituted for required one (1) hour fire-resistance rated construction. Assembly (A) occupancies other than restaurants shall have not less than one-half ( $\frac{1}{2}$ ) of their required exitways opening directly to the exterior of the covered mall building.

**432.2.8 Fire protection:** Every covered mall building shall be provided with fire protection equipment as follows:

1. The covered mall and all buildings connected thereto shall be provided throughout with an approved fire suppression system. The suppression system in the covered mall shall be independent of the suppression systems in the buildings connected to the covered mall.
2. All sprinkler control valves shall be electrically supervised and connected to either the fire department or to an approved supervisory service.



3. Fire department standpipe outlets shall be provided within the mall at each entrance to an exit passageway, corridor or enclosed stairway and at exterior exits.
4. First aid fire extinguishers shall be provided as required by the fire prevention code listed in Appendix B.

**432.2.9 Fire emergency ventilating system:** The covered mall and exit-way corridors serving the mall shall be equipped with an approved automatic exhaust system capable of producing six (6) air changes per hour computed on volume measured to a height of twelve (12) feet above each pedestrian area. Necessary outside air to accomplish the six (6) air changes per hour shall be provided.

The exhaust system shall be activated by smoke detectors complying with the applicable standards listed in Appendix I, by operation of the sprinkler system, and manually. The activation system shall be installed in an approved manner. Exhaust shall be taken uniformly from the entire mall area and exitways serving the mall through an approved duct system with vents spaced not more than fifty (50) feet or through a ceiling plenum with uniformly distributed openings. Where tenant spaces are open to the mall area exhaust may be taken through the tenant spaces.

The approved automatic exhaust system may be a separate system or may be intergrated with an approved air-conditioning system. Where a separate system is provided, operation of the fire emergency ventilating system shall automatically shut down the air-conditioning system or any other devices which interfere with the effective operation of the fire emergency ventilating system.

**432.2.10 Fire department access to equipment:** Controls for air-conditioning systems, sprinkler risers and valves, or other fire detection, suppression or control elements shall be accessible to and properly identified for use by the fire department.

**432.2.11 Plastic panels and plastic signs:** Within every story or level and from side wall to side wall of each tenant, approved plastic panels and signs shall be limited as follows:

1. They shall not exceed twenty (20) per cent of the wall area facing the mall.
2. They shall not exceed a height of thirty-six (36) inches, except if the sign is vertical, the height shall not exceed ninety-six (96) inches and the width shall not exceed thirty-six (36) inches.
3. They shall be located a minimum distance of eighteen (18) inches from adjacent tenants.
4. All edges and the backs shall be fully encased in metal.

**432.2.12 Kiosks:** Kiosks and similar structures (temporary or permanent) shall meet the following requirements:

1. Combustible kiosks or other structures shall not be located within the covered mall unless constructed of fire retardant treated wood throughout, conforming to the standards listed in Appendices C and G.
2. Kiosks or similar structures located within the covered mall shall be provided with approved fire suppression and detection devices.
3. The minimum horizontal separation between kiosks and other structures within the covered mall shall be twenty (20) feet.
4. Kiosks or similar structures shall have a maximum area of three hundred (300) square feet.

# ARTICLE 5

## LIGHT, VENTILATION AND SOUND TRANSMISSION CONTROL

### SECTION 500.0 GENERAL

**500.1 Scope:** The provisions of this article shall govern the means of light and ventilation required in all habitable and occupiable spaces and rooms. Every building and structure hereafter erected and every building room or space which is changed in use shall be constructed, arranged and equipped to conform to the requirements of this article and the applicable standards listed in Appendix B.

**500.2 Conflicting laws:** The provisions in this article shall not be construed to nullify the provisions of any other law or ordinance regulating yards, courts, or other spaces required for light or ventilation; but the provisions specifying the greater requirements shall control the construction.

**500.3 Buildings on same lot:** If more than one (1) building is hereafter placed on a lot, or if a building is placed on the same lot with existing buildings, the several buildings may be treated as a single structure for the purpose of this article, provided equivalent uncovered lot area or other adequate sources of light and ventilation are furnished for all habitable and occupiable spaces and rooms.

**500.4 Other standards:** Compliance with the applicable provisions of the standards listed in Appendix B shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

### SECTION 501.0 PLANS AND SPECIFICATIONS

**501.1 General:** Plans for all buildings and structures other than one- and two-family and multi-family dwellings, which are designed for human occupancy, shall designate the number of occupants to be accommodated in the various rooms and spaces, and when means of artificial lighting and ventilation are required, the application shall include sufficient details and description of the mechanical system to be installed as herein required or as specified in the mechanical code listed in Appendix B.

## SECTION 502.0 STANDARDS OF NATURAL LIGHT

**502.1 General:** In the application of the provisions of this article, the standard of natural light for all habitable and occupiable rooms, unless otherwise specifically required by the provisions of Article 4 for special uses and occupancies, shall be based on two hundred and fifty (250) foot candles of illumination on the vertical plane adjacent to the exterior of the light transmitting device in the enclosure wall and shall be adequate to provide an average illumination of six (6) foot candles over the area of the room at a height of thirty (30) inches above the floor level.

## SECTION 503.0 STANDARDS OF NATURAL VENTILATION

**503.1 General:** In the application of the provisions of this article, the standard of natural ventilation for all habitable and occupiable rooms shall be based on a volume of four hundred (400) cubic feet of air per occupant with ventilating skylights, monitors, louvres, windows, transoms, doors or other alternate ventilating devices located in the exterior walls or on the roof of the building as provided in Sections 506.0 to 514.0 inclusive.

## SECTION 504.0 ARTIFICIAL LIGHT AND VENTILATION

**504.1 When required:** When natural light and ventilation do not meet the minimum requirements of this code, or when rooms, which by use or occupancy, involve the presence of dust, fumes, gases, vapors or other noxious or deleterious impurities that create a fire or health hazard, or when required by the provisions of Article 4 for special uses, the building shall be equipped with artificial light and mechanical means of ventilation under the conditions and of the minimum capacity prescribed herein and in the mechanical code listed in Appendix B.

**504.2 Operation of ventilating systems:** Where mechanical ventilation is accepted as an alternate for natural means of ventilation, or is required under the conditions herein prescribed, the system, equipment and distributing ducts shall be installed in accordance with the provisions of Article 10 and the mechanical code listed in Appendix B. Ventilating systems shall be kept in operation at all times during normal occupancy of the building or space so used.

**504.3 Habitable rooms:** The glazed areas of windows and exterior doors in habitable rooms and spaces need not be openable where an approved mechanical ventilation system is provided capable of producing two (2) changes of air per hour. Recirculation of not more than seventy-five (75) per cent of the air supplied may be permitted in habitable rooms except kitchens, provided the air recirculated does not come from a plenum or system fed with air returned from habitable rooms occupied by other families, or from the stairways or common hallways; except that recirculation of one hundred (100) per cent of the air supplied may be permitted if the system supplies only a single dwelling unit.

**SECTION 505.0 EXISTING BUILDINGS**

**505.1 Unsafe conditions:** In all existing rooms or spaces in which the provisions for light and ventilation do not meet the requirements of this article and which, in the opinion of the building official, are dangerous to the health and safety of the occupants, he shall order the required repairs or installations to render the building or structure livable for the posted use and occupancy load.

**505.2 Alterations:** A building shall not hereafter be altered or rearranged so as to reduce either the size of a room, or the fresh air supply, or the amount of available natural light to less than that required for buildings hereafter erected; or to create an additional room unless made to conform to the requirements of Section 506.0. The building official may permit new rooms to be of the same height as existing rooms in the same story unless in his opinion greater provision of artificial light and ventilation is deemed necessary to insure healthful living conditions.

**505.3 Uncovered yard and court area:** A building shall not be hereafter enlarged, nor shall the lot on which it is located be diminished so as to decrease the required courts or yards to less than that prescribed in this article for the lighting and ventilation of new buildings.

**SECTION 506.0 NATURAL LIGHTING AND VENTILATION OF ROOMS**

**506.1 Window and skylights:** All habitable and occupiable rooms or spaces shall contain windows, skylights, monitors, glazed doors, transoms, glass block panels or other light transmitting media opening to the sky or on a public street, yard or court complying with the provisions of this article. The light transmitting properties and the area of the devices used shall be adequate to meet the minimum daylighting and ventilating requirements specified herein and in the approved rules.

**506.2 Window size:** Windows and exterior doors may be used as a natural means of light and ventilation, and when so used their aggregate glass area shall amount to not less than eight (8) per cent of the floor area served, and with not less than one-half ( $\frac{1}{2}$ ) of this required area available for unobstructed ventilation.

**506.3 Openings on yards and courts:** In order to be credited as a source of natural light or ventilation under the provisions of this article, a window or any other approved device shall open directly on a public street, alley or other open public space, or on a yard or court located on the same lot or plot complying with the requirements of Sections 516.0, 517.0 and 518.0.

**506.4 Alternate devices:** In place of the means for natural light and ventilation herein prescribed, alternate arrangement of windows, louvers, or other methods and devices that will provide the equivalent minimum performance requirements shall be permitted when complying with the approved rules.

### 506.5 Room dimensions

**506.5.1 Ceiling heights:** Habitable (space) rooms, other than kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than seven (7) feet six (6) inches. Hallways, corridors, bathrooms, water closet rooms, and kitchens shall have a ceiling height of not less than seven (7) feet measured to the lowest projection from the ceiling.

If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one-half ( $\frac{1}{2}$ ) the area thereof. No portion of the room measuring less than five (5) feet from the finished floor to the finished ceiling shall be included in any computation of the minimum area thereof.

If any room has a furred ceiling, the prescribed ceiling height is required in two-thirds ( $\frac{2}{3}$ ) of the area thereof, but in no case shall the height of the furred ceiling be less than seven (7) feet.

**506.5.2 Floor area:** Every dwelling unit shall have at least one room which shall have not less than one hundred fifty (150) square feet of floor area. Other habitable rooms except kitchens shall have an area of not less than seventy (70) square feet.

**506.5.3 Width:** No habitable room other than a kitchen shall be less than seven (7) feet in any dimension.

### SECTION 507.0 LIGHTING AND VENTING OF SPECIAL SPACES

**507.1 Alcove rooms:** When alcove rooms open without obstruction into adjoining rooms, the required window openings to the outer air shall be based on the combined floor area of room and alcove. An alcove space shall not be more than sixty (60) square feet in area and the opening to the adjoining room shall be not less than eighty (80) per cent of the superficial area of the dividing wall, unless provided with separate means of light and ventilation.

**507.2 Attic spaces:** All attic spaces and spaces between roofs and top floor ceilings shall be ventilated by not less than two (2) opposite windows, louvres, or vents with a total clear area of opening not less than one-third ( $\frac{1}{3}$ ) of one (1) per cent of the horizontally projected roof area.

**507.3 Crawl spaces:** In buildings and structures constructed without basements, in which the first floor construction does not bear directly on the ground, a space shall be provided under the first floor not less than eighteen (18) inches in depth; and such space shall be vented with screened openings having a clear area of not less than one-third ( $\frac{1}{3}$ ) of one (1) per cent of the enclosed building area, or shall be provided with other means of ventilation approved by the building official. When floating mat foundations are provided in accordance with Section 726.3, the requirement for ventilation shall not apply.

### SECTION 508.0 BASEMENTS AND CELLARS

**508.1 General:** Except as may be otherwise specified for habitable or occupiable rooms or specifically provided in Article 4 for special uses, the glass window area in basements and cellars, except crawl spaces as provided in Section 507.3, shall be not less than one-fiftieth ( $\frac{1}{50}$ ) of the floor area served, and provisions shall be made for fresh air supply prescribed for specific uses in Section 514.0 and the mechanical code listed in Appendix B.

### SECTION 509.0 BUSINESS AND WORK ROOMS

**509.1 General:** Offices, stores, mercantile and salesrooms, restaurants, markets, bakeries, hotel and restaurant kitchens, factories, workshops, machinery and boiler rooms shall be provided with the required windows specified in Section 506.0 for habitable and occupiable rooms, opening directly on a street or required yard or court; or such rooms shall be equipped with an approved system of mechanical ventilation complying with Section 504.0 and the mechanical code listed in Appendix B.

### SECTION 510.0 ASSEMBLY ROOMS

**510.1 General:** In addition to the requirements of Article 4 for special uses, the required windows or other approved devices for natural ventilation shall be distributed as equally as practicable on at least two (2) sides of the room; and artificial lighting shall comply with the requirements of this article and Article 15.

### SECTION 511.0 ROOMS OF INSTITUTIONAL BUILDINGS

**511.1 General:** In buildings of the institutional use group, every habitable and occupiable room shall be provided with light and ventilation as herein provided, except that in buildings used for enforced detention of people (use group I-1) indirect openings to the street or court may be permitted through intermediate corridors or by other approved means of light and ventilation.

### SECTION 512.0 BATH AND TOILET ROOMS

**512.1 General:** Every bath and toilet room shall be lighted and ventilated by one (1) of the methods prescribed in Sections 512.2 through 512.7.

**512.2 Exterior windows:** Windows opening to the outer air as provided in Section 506.0 but not less than three (3) square feet in area.

**512.3 Vent shaft windows:** Windows as provided in Section 506.0 but not less than three (3) square feet in area, opening on a vent shaft with a cross-sectional area of one (1) square foot for every foot in height,

but not less than nine (9) square feet in area, open to the outer air at top or constructed with equivalent side louver openings.

**512.4 Vents and ducts:** Individual vents or ducts constructed of approved noncombustible materials complying with Section 1009.0 with a minimum cross-sectional area of one-half ( $\frac{1}{2}$ ) square foot and one-third ( $\frac{1}{3}$ ) additional square foot for each additional water closet or urinal above two (2) in number. Such ducts shall be of adequate height and so located as to insure a minimum supply of two (2) cubic feet of fresh air per square foot of room area.

**512.5 Skylights:** A skylight of approved noncombustible construction complying with Section 925.3, and not less than three (3) square feet in area with ventilating opening.

**512.6 Mechanical ventilating systems:** Any system of mechanical or gravity ventilation capable of producing a change of air every 12 minutes in private bathrooms. Public bathroom mechanical ventilation systems shall comply with the mechanical code listed in Appendix B.

**512.6.1 Recirculation:** Recirculation of air supplied to toilet rooms, bathrooms and rest rooms shall not be permitted.

**512.7 Artificial lighting:** Illumination shall be provided in all toilet rooms to afford an average intensity of three (3) foot candles measured at a level thirty (30) inches above the floor.

## SECTION 513.0 STAIRWAYS AND EXITWAYS

### 513.1 Residential and institutional buildings

**513.1.1 Windows:** In all multi-family dwellings (use group R-2) and in institutional buildings for the care or treatment of people (use group I-2) required interior stairways shall be provided with windows to the outer air having a glass area of not less than ten (10) square feet which opens on a required street, alley, yard or court, or with the equivalent source of light for each story through which the stairway passes; and such additional artificial lighting to provide the equivalent illumination at all times that the building is occupied as specified in Section 624.0 and Article 15.

**513.1.2 Skylights:** When the building is not more than three (3) stories in height, a ventilating skylight of the required area may be used in lieu of windows.

**513.1.3 Hallways:** Hallways shall have at least one (1) window opening directly on a street or on a required yard or court in each story, located so that light penetrates the full length of the hallway, with additional windows for each change of direction of the hallway; or the equivalent artificial lighting shall be provided. Every recess or return with a depth or length which exceeds twice the width of the hall, and every corridor



separately shut off by a door, shall be treated as a separate hall in applying the provisions of this section.

**513.1.4 Mechanical ventilating systems:** All exitways and common corridors in multi-family dwellings (use group R-2) and in institutional (use group I) buildings shall be provided with not less than one and one-half ( $1\frac{1}{2}$ ) cubic feet per minute of fresh air per square foot of floor area. Not more than seventy-five (75) per cent of the air supplied shall be recirculated.

**513.2 Business and assembly buildings:** All stairway enclosures shall conform to the requirements of Articles 6 and 9 for construction and shall have the means of artificial illumination to meet the requirements of this article and Article 15.

**513.3 Intensity of illumination:** In all required exitways, except in one- and two-family dwellings, and wherever natural lighting is not available, artificial lighting shall be provided to furnish not less than three (3) foot candles at the floor level of all required exitways.

#### **SECTION 514.0 REQUIRED FRESH AIR SUPPLY**

**514.1 General:** Mechanical or gravity systems of ventilation shall provide the minimum air changes per hour specified in this code and the mechanical code listed in Appendix B. Recirculation of air supplied to kitchens, lavatories, toilet rooms, bathrooms, rest rooms, laboratories and garages shall not be permitted.

#### **SECTION 515.0 VENTILATION OF SHAFTS OTHER THAN ELEVATOR AND DUMBWAITER HOISTWAYS**

**515.1 General:** All enclosed vertical shafts extending through more than two (2) stories of every building or structure, except elevator or dumbwaiter hoistways, shall be automatically vented to the outer air as herein required or as specified in Section 910.0.

**515.2 Extending to roof:** Shaft enclosures extending to the roof shall be provided with a metal skylight constructed to comply with Section 925.3 or with windows of equivalent area or with other approved automatic means of removing hot air and gases.

**515.3 Thermostatic control:** The automatic operation of fire shutters, skylights and other vent relief devices may be controlled by fusible links designed to operate at a fixed temperature of not more than one hundred and sixty (160) degrees F., or by electric or pneumatic operation under a rapid rise in temperature at a rate of fifteen (15) to twenty (20) degrees F. per minute or by other approved methods.

**515.4 Not extending to roof:** Shaft enclosures not extending to the roof shall be provided with gas and smoke relief vents or adequate mechanical

means of ventilation in conformity to the provisions of Section 910.6 and the mechanical code listed in Appendix B.

## SECTION 516.0 COURTS

**516.1 General:** All courts required to serve rooms for light and ventilation purposes shall comply with the requirements of this section.

### 516.2 Width of court

**516.2.1 Minimum width:** Every such court shall have a minimum width of three (3) inches for each foot of height or fraction thereof but not less than five (5) feet for outer courts and twice these values for inner courts.

**516.2.2 Irregular court width:** In the case of irregular or gore-shaped courts, the required minimum width of a court may be deemed to be the average width, provided that such a court shall not be less than five (5) feet at any point.

**516.3 Area of court:** The cross-sectional area of a required court shall be not less than one and one-half ( $1\frac{1}{2}$ ) times the square of its width; nor shall the length of any court be more than twice its width.

**516.4 Access to court:** A door or other means of access shall be provided at the bottom of every court that is not otherwise conveniently accessible for purposes of cleaning.

### 516.5 Air intakes to court

**516.5.1 Inner court:** Every court serving one (1) or more habitable rooms that does not open for its full height on one (1) or more sides to a street or legal yard shall be connected at or near the bottom with a street or yard by a horizontal intake or passage of fireresistive construction. Such intake or passage shall have a cross-sectional area of not less than twenty-one (21) square feet, and shall remain fully open at both ends and unobstructed for its full size and length, except that grilles of noncombustible construction complying with the approved rules may be permitted at the ends of the intake.

**516.5.2 Fireresistance:** The walls, floors and ceilings of such intakes or passages shall have a fireresistance rating of not less than two (2) hours in buildings of Types 1, 2 or 3 construction and not less than one (1) hour in Type 4 construction.

**516.6 Court walls:** When, in the opinion of the building official, windows facing on courts do not receive adequate direct light by reason of peculiar arrangement or orientation, he may require the walls to be constructed of light colored masonry, or to be painted and maintained a light color to furnish additional reflected light.

**516.7 Court drainage:** The bottom of every court shall be properly

graded and drained to a public sewer or other approved disposal system complying with the plumbing code listed in Appendix B; and shall be paved with concrete or other non-absorbent material when required by the building official.

#### **SECTION 517.0 REAR YARDS**

**517.1 Residential and institutional buildings:** At the rear of every building hereafter erected to be occupied as a one- and two-family or multi-family dwelling (use groups R-2 and R-3), or institutional building (use group I), there shall be maintained a yard of the minimum dimensions herein prescribed. When such yard serves as a required light and ventilation court, its minimum dimensions shall be those required for a court in this article.

**517.1.1 Depth of yards:** The depth of a required yard between the extreme rear of the building and the rear lot line shall be not less than fifteen (15) feet at any point for a height of thirty-five (35) feet, and shall increase four (4) inches in depth for each additional foot of height above that limit; except that for a corner lot the minimum depth shall be not less than ten (10) feet. When the lot is less than sixty-five (65) feet in depth, the required yard may be diminished six (6) inches in depth for each foot less than sixty-five (65) feet.

**517.2 Other use groups:** In buildings of other use groups, rear yards shall be provided to serve all habitable and occupiable rooms requiring light and ventilation from such source. The lowest level of such yards shall begin at the sill level of the second story windows, with a depth of not less than ten (10) feet for a height of thirty-five (35) feet and shall increase three (3) inches for each additional foot of height above that level.

#### **SECTION 518.0 OBSTRUCTION OF COURTS AND YARDS**

**518.1 Permissible projections:** Every required court and yard shall remain unobstructed for its required area and full height, except for the projections permitted in Section 311.0. In residential and institutional buildings, clothes poles, arbors, garden trellises and other such accessories shall not be prohibited in the open spaces at ground level.

**518.2 Motor vehicle parking:** When approved by the building official, required court and yard areas may be used for automobile parking spaces or private garages not exceeding one (1) story in height when accessory to and only for the use of the occupants of a residential building, provided required windows for light and ventilation are not obstructed thereby.

#### **SECTION 519.0 FIRE EMERGENCY VENTILATING SYSTEM**

**519.1 Common corridors:** In all buildings and structures herein re-

quired to have fire emergency ventilating systems, the common corridors shall be constructed with:

1. vertical fire vent stacks and lateral fire vent ducts as herein provided, or
2. windows to the outer air, or
3. mechanical ventilating or exhaust systems, or
4. other equivalent approved means for dissipating smoke, heated air and toxic gases directly to the outer air in the event of fire.

**519.2 Where required:** Fire emergency ventilating systems shall be provided as described below.

1. In buildings used for I-1 and I-2 (institutional) use groups which:
  - a) exceed three (3) stories or forty (40) feet in height, and
  - b) exceed ten thousand (10,000) square feet in floor area, and
  - c) are occupied by more than fifty (50) persons above the first floor, or have more than twenty-five (25) sleeping rooms above the first floor.
2. In buildings used for R-1 and R-2 (hotel and apartment house) use groups which:
  - a) same as 1.a) above,
  - b) same as 1.b) above,
  - c) same as 1.c) above.
3. In all fully enclosed industrial buildings without provision of exterior openings for ventilation purposes.

**519.3 Fire vent ducts:** When the common corridors and exitways are not ventilated by windows opening directly to the outer air as required in Section 513.0, a system of collecting fire ducts shall be provided in each story of aggregate size to remove the smoke, hot air and noxious fumes or gases in event of fire. Each duct shall be not less than one (1) square foot in area located in the common hallways, with screened openings complying with the approved rules, constructed as provided for hot air ducts in Section 1009.0.

**519.4 Thermostatic operation:** When not connected to a vent stack, the inlet openings on each story shall be controlled by automatic heat-operated devices as required in Section 515.3 and in accordance with the approved rules.

**519.5 Fire vent stacks:** When the fire ducts do not discharge directly to the outer air in each story, one (1) or more fire vent stacks of adequate capacity shall be installed to accommodate the discharge from the fire duct system in any one (1) floor or enclosed fire area, but an individual stack shall not be less than four (4) square feet in area, and all stacks shall terminate in an approved automatic cowl or ventilator outlet above the roof.

**519.6 Location of stacks:** The vent stack shall be located in as central a position as practicable with respect to the floor area vented thereby,

preferably in the vicinity of vertical shafts, and shall extend continuously to the roof.

**519.7 Vent control of stacks:** The vent control of the vertical stacks shall consist of approved noncombustible dampers, shutters, or glazed metal sash designed to open outwardly, located not less than twenty (20) feet distant from window openings or exitway doors in adjoining walls, and shall be equipped with a thermostatic unit arranged to open at a predetermined rate of temperature rise in accordance with the approved rules. Auxiliary mechanical means for manual operation of all vent controls shall be provided in an accessible location designated by the building official.

**519.8 Stack construction:** The stack enclosure shall be constructed to be vapor and smoke tight with walls of not less than two (2) hour fire resistance rating, and without openings others than the fire duct inlets and the top automatic ventilator outlet.

**519.9 Mechanical exhaust systems:** When mechanical exhaust is required to operate the emergency ventilating system either in horizontal ducts or vertical vent stacks, the installation shall be thermostatically controlled and installed in accordance with the provisions of the mechanical code listed in Appendix B and the approved rules.

## SECTION 520.0 FIRE VENTILATION OF OPEN WELLS

**520.1 General:** Open wells including unenclosed supplemental stairways and well openings for moving stairways constructed in accordance with the provisions of Section 1619.0 and not accepted as a required element of an exitway shall be permitted in buildings of other than use groups A-4, and I (assembly, schools; and institutional) when equipped with an approved automatic fire suppression system and protected on every floor pierced by the opening with an approved automatic exhaust system or by other approved method as herein required to prevent the passage of fire, smoke and gases to the story above.

**520.2 Exhaust system:** The approved automatic exhaust system may be a separate unit or integrated with an approved air conditioning system and shall be thermostatically controlled to operate simultaneously with the detection of fire.

**520.2.1 Capacity of exhaust system:** The exhaust system shall be of adequate capacity to create a down draft in the open well with sufficient velocity of flow over the entire area of the well opening under normal conditions of window and door openings in the building. In air conditioned buildings, the system shall operate in a manner satisfactory to the building official with the normal air conditioning fans shut off.

**520.3 Draft stop:** An approved draft stop shall be installed at each story of the open well. The draft stop shall enclose the perimeter of the unen-

closed opening and shall extend from the ceiling downward at least eighteen (18) inches on all sides. Automatic sprinklers shall be provided around the perimeter of the opening and within two (2) feet of the draft stop. The distance between the sprinklers shall not exceed six (6) feet center to center.

**520.4 Electrical power:** The electrical power for all parts of the exhaust system and fresh air intake shall be supplied from an emergency electrical system.

**520.5 Alternate protection:** Unenclosed stairwells, when not protected as herein specified, shall be equipped with an approved automatic power-controlled fire shutter conforming to the provisions of Section 1619.3.

**520.6 Air-conditioned buildings:** The exhaust system herein required, when installed in an air-conditioned building, shall be so arranged as to automatically stop the operation of the mechanical air-conditioning and ventilating systems and close the dampers of the return air duct connection in the event of fire.

#### **SECTION 521.0 WINDOW CLEANING SAFEGUARDS**

**521.1 General:** All buildings and structures over fifty (50) feet or four (4) stories in height, in which the windows are cleaned from the outside, shall be provided with anchors or other approved safety devices for all window openings. Such anchors, belt terminals or other devices shall be of approved design, and constructed of corrosion-resistive materials securely attached to the window frames or anchored in the enclosure walls of the building. Cast iron or cast bronze anchors shall be prohibited.

#### **SECTION 522.0 SOUND TRANSMISSION CONTROL IN RESIDENTIAL BUILDINGS**

**522.1 Scope:** This section shall apply to all common interior walls, partitions and floor-ceiling constructions between adjacent tenant units or between a tenant unit and adjacent public areas such as halls, corridors, stairs or service areas in all residential occupancies.

**522.2 Airborne noise:** Walls, partitions and floor-ceiling constructions separating tenant units from each other or from public or service areas shall have a sound transmission class (STC) of not less than forty-five (45) for airborne noise. This requirement shall not apply to dwelling unit entrance doors. However, such doors shall be tight fitting to the frame and sill.

**522.2.1 Tested assemblies:** All walls, partitions and floor-ceiling constructions tested in accordance with the applicable standard ASTM E90 listed in Appendix C and which meet the requirements for a forty-five

(45) STC rating shall be considered as meeting the requirements of this section.

**522.3 Structure-borne sound:** Floor-ceiling constructions between tenant units and between a tenant unit and public or service areas within the structure shall have an impact insulation class (IIC) rating of not less than forty-five (45).

**522.3.1 Tested assemblies:** All floor-ceiling constructions tested in accordance with the applicable standard ASTM E492 listed in Appendix C and which meet the requirements for a forty-five (45) IIC rating shall be considered as meeting the requirements of this section.





# ARTICLE 6

## MEANS OF EGRESS

### SECTION 600.0 GENERAL

**600.1 Scope:** The provisions of this article shall control the design, construction and arrangement of building elements required to provide a reasonably safe means of egress from all buildings hereafter erected, and from all buildings hereafter altered to a new occupancy load, or manner of use, or inherent fire hazard. Existing buildings and uses shall be controlled by the provisions of Section 604.0.

**600.2 Modification of exitway requirements:** When strict compliance with the provisions of this code is not practical, the building official may accept alternate means of egress which will accomplish the same purpose, by the procedure established in Article 1 for modification of this code, or by adoption of approved rules. Existing buildings shall not be occupied during repairs or alterations unless all existing exitways and any existing fire protection are continuously maintained, or in lieu thereof other measures are taken which provide equivalent safety.

**600.3 Minimum requirements:** It shall be unlawful to alter any building or structure in any manner that will reduce the number of exitways or the capacity of exitways below the requirements of this code for new buildings of the proposed use and occupancy.

**600.4 Other standards:** Compliance with the applicable provisions of the standards listed in Appendix B shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

### SECTION 601.0 PLANS AND SPECIFICATIONS

**601.1 Arrangement of exitways:** The plans shall show in sufficient detail the location, construction, size and character of all exitways together with the arrangement of aisles, corridors, passageways and hallways leading thereto in compliance with the provisions of this code.

**601.2 Number of occupants:** In other than one- and two-family and multi-family dwellings, the plans and the application for permit shall

designate the number of occupants to be accommodated on every floor, and in all rooms and spaces when required by the building official. When not otherwise specified, the minimum number of occupants to be accommodated by the exitways shall be determined by the occupancy load prescribed in Section 606.0. The posted occupancy load of the building shall be limited to that number.

#### **SECTION 602.0 USE AND OCCUPANCY REQUIREMENTS**

**602.1 New buildings:** Every building and structure and part thereof hereafter erected shall have the prescribed number of exitways of one (1) or more of the approved types defined in this article. Exitways, in combination with the exitway access and exitway discharge, shall provide safe and continuous means of egress to a street or to an open space with direct access to a street.

**602.2 Mixed use groups:** In buildings classified in more than one (1) use group, each fire area shall be considered separately in determining the required number, capacity, size and construction of all exitways.

**602.3 Multiple tenants:** When more than one (1) tenant occupies any one (1) floor of a building or structure, each tenant shall be provided with direct access to approved exitways.

#### **SECTION 603.0 AIR-CONDITIONED BUILDINGS**

**603.1 Location of stairways:** In all buildings, without exterior window openings in all stories, that are artificially ventilated and air-conditioned as provided in Section 504.0, the stairway element of required exitways shall be located as to be accessible to the fire department either through the access openings specified in Section 859.0 or as otherwise approved in at least alternate stories of the building.

**603.2 Exhaust ducts:** Exhaust ducts or vents of air-conditioning systems shall not discharge into stairway or elevator enclosures, nor shall corridors serving as exitway access be used as the return exhaust from air-conditioned spaces through louvres or other devices in the doors or partitions enclosing such air-conditioned spaces; unless such passageways are equipped with approved smoke detectors to automatically stop the supply and exhaust fans and close the louvres, and unless such use is approved by the building official.

#### **SECTION 604.0 EXISTING BUILDINGS**

**604.1 Owner responsibility:** The owner or lessee of every existing building and structure shall be responsible for the safety of all persons in, or occupying, such premises with respect to the adequacy of means of egress therefrom.

## **604.2 Unsafe means of egress**

**604.2.1 Inadequate exitways:** In any existing building or structure, not provided with exitway facilities as herein prescribed for new buildings and in which the exitways are deemed inadequate for safety by the building official, such additional provision shall be made for safe means of egress as he shall order.

**604.2.2 Appeal from exitway order:** Within seven (7) days after the service of the exitway order of the building official, the owner may file a written appeal therefrom, and the building official shall appoint a board of survey as required in Section 125.0 to make a final determination.

## **SECTION 605.0 MAINTENANCE OF EXITWAYS**

**605.1 Obstructions:** It shall be unlawful to obstruct, or reduce in any manner, the clear widths of any doorway, hallway, passageway or any other exitway required by the provisions of this code.

**605.2 Maintenance:** All exterior stairways and fire escapes shall be kept free of snow and ice. They shall be properly painted before and after erection; and shall be scraped and painted as often as necessary to maintain them in safe condition.

## **SECTION 606.0 OCCUPANCY LOAD**

**606.1 Design occupancy load:** In determining required exitway facilities, the number of occupants for whom exitway facilities shall be provided shall be established by the largest number computed as follows:

1. the actual number of occupants for whom each occupied space, floor, or building, as the case may be, is designed for; or
2. the number of occupants computed at the rate of one (1) occupant per unit of area as prescribed in Table 606; or
3. the number of occupants of any space as computed in 1 or 2 above, plus the number of occupants similarly computed for all spaces that discharge through the space in order to gain access to an exitway.

**606.1.1 Assembly occupancy:** The occupancy load for places of assembly may be determined as provided in Section 606.1 if the necessary aisles and means of egress are provided as approved by the building official. An aisle, egress and seating diagram may be required by the building official to substantiate the occupancy load.

**606.2 Mezzanine levels:** The occupancy load of a mezzanine level discharging through a floor below shall be added to that floor occupancy and the capacity of the exitways shall be designed for the total occupancy load thus established.

**606.3 Roofs:** Roof areas occupied as roof gardens or for assembly, storage or other purposes shall be provided with exitway facilities to

accommodate the required occupancy load, but there shall not be less than two (2) approved means of egress for assembly uses from such roof areas.

**606.4 Special or unlisted occupancies:** Where data regarding the square feet per person for an occupancy is not listed in Table 606, the occupant load shall be established by the architect or engineer, subject to the approval of the building official.

**Table 606**  
**MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

Use	Floor area in square feet per occupant
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Unconcentrated (tables and chairs)	15 net
Standing space	3 net
Assembly with fixed seats	Note 1
Business areas	100 gross
Court rooms	40 net
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Industrial areas	200 gross
Institutional areas	
Sleeping areas	80 gross
Inpatient treatment areas	240 gross
Outpatient areas	100 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Mercantile, basement and grade floor areas	30 gross
Areas on other floors	60 gross
Storage, shipping areas	100 gross
Residential	200 gross
Storage areas, mechanical equipment room	300 gross
Bowling alleys, allow 5 persons for each alley including 15 feet of runway, and for additional areas	7 net

**Note 1.** The occupant load for an assembly area having fixed seats shall be determined by the number of fixed seats installed.

**606.5 Conflicts:** When there are special requirements for specific occupancies and uses which differ from general requirements herein prescribed, such special provisions shall take precedence.

**606.6 Non-simultaneous occupancy:** The occupant load of toilets, locker rooms, meeting rooms, storage rooms, employee cafeterias, and similar rooms or spaces that are not occupied at the same time as other rooms or spaces on the same floor of a building, may be omitted from the occupant load calculation of the floor on which they are located, to the extent that such spaces only serve occupied rooms on the same floor.

**606.7 Modifications:** The following modifications may be used in determining the occupant load.

1. When the actual occupant load of any space will be significantly different than that determined by Table 606, the building official may establish an alternate basis for the determination of the occupant load. The space occupied by permanent fixtures or displays may serve to reduce the occupant load.
2. When a building is altered or changed in occupancy or use so as to require enlarged exitway facilities, the building official may authorize the alteration or change in occupancy or use without an enlargement of exitway facilities, provided the occupant load is limited to that accommodated by the existing exitway facilities as determined by the provisions of this code, and the building or space is posted as required by Section 120.0.

## SECTION 607.0 TYPES AND LOCATION OF EXITWAYS

**607.1 General:** All approved exitways, including doorways, passageways, corridors, interior stairways, exterior stairways, moving stairways, smokeproof enclosures, ramps, horizontal exits, bridges, balconies, fire escapes and combinations thereof shall be arranged and constructed as provided in this code.

**607.2 Arrangement:** All required exitways shall be so located as to be discernable and accessible with unobstructed access thereto and so arranged as to lead directly to the street or to an area of refuge with supplemental means of egress that will not be obstructed or impaired by fire, smoke or other cause.

**607.2.1 Exitway discharge:** All exitways shall discharge directly at a public way or at a yard, court or open space of the required width and size to provide all occupants with a safe access to a public way.

**607.3 Remote location:** Whenever more than one (1) exitway is required from any room, space or floor of a building, they shall be placed as remote from each other as practicable, and shall be arranged to provide direct access in separate directions from any point in the area served.

**607.4 Length of travel:** Except as modified by provisions of Section 609.3 for buildings with one (1) exitway, all exitways shall be so located that the maximum length of exitway access travel, measured from the most remote point to an approved exitway along the natural and unobstructed line of travel shall not exceed the distances given in Table 607; except where the area is subdivided into rooms or compartments, and the egress travel in the room or compartment is not greater than fifty (50) feet [one hundred (100) ft. in use groups equipped with an automatic fire suppression system], the distance shall be measured from the exitway access entrance to the nearest exitway.

**Table 607**  
**LENGTH OF EXITWAY ACCESS TRAVEL (FT.)**

Use group	Without fire suppression system	With fire suppression system
Assembly	150	200
Business	200	300
Factory and industrial	200	300
High hazard		75
Institutional	100	200
Mercantile	100	150
Residential	100	150
Storage, low hazard	300	400
Storage, moderate hazard	200	300

**Note.** The maximum length of exitway access travel in unlimited area buildings shall be 400 feet.

### SECTION 608.0 CAPACITY OF EXITS

**608.1 Unit of egress width:** The unit of egress width for all approved types of means of egress parts and facilities shall be twenty-two (22) inches with a credit of one-half ( $\frac{1}{2}$ ) unit for each twelve (12) inches width in addition to one (1) or more twenty-two (22) inch units. Fractions of a unit of width less than twelve (12) inches shall not be credited.

**608.2 Design allowance for use groups:** Except as may be specifically modified in Article 4, the design capacity per unit of egress width shall be computed in accordance with Table 608 for the specified use groups.

**Table 608**  
**CAPACITY PER UNIT EGRESS WIDTH**

Use group	Without fire suppression system Number of occupants		With fire suppression system Number of occupants	
	Stairways	Doors, ramps and corridors	Stairways	Doors, ramps and corridors
Assembly	75	100	113	150
Business	60	100	90	150
Factory and industrial	60	100	90	150
High hazard			60	100
Institutional	22	30	33	45
Mercantile	60	100	90	150
Residential	75	100	113	150
Storage	60	100	90	150

**Note.** The main exitway of a bowling alley shall be of sufficient capacity to accommodate 50 per cent of the total occupant load, without regard to the number of aisles which it serves.

### SECTION 609.0 NUMBER OF EXITWAYS

**609.1 General:** The following general requirements apply to buildings of all use groups. More restrictive requirements that may be provided in Article 4 for special uses and occupancies shall take precedence over the general provisions of this section.

**609.2 Minimum number:** There shall be not less than two (2) approved independent exitways serving every story, except in one- and two-family dwellings and as modified in Section 609.3.

**609.3 Buildings with one exitway:** Only one (1) exitway shall be required in buildings of the use group and characteristics specified in the following Table 609 and in the first story of buildings two thousand (2,000) square feet or less in area with an occupancy load not exceeding fifty (50) persons on the first story.

**Table 609**  
**BUILDINGS WITH ONE EXITWAY**

Characteristics of the building					
Use group	Max. height above grade <sup>1</sup>	Size	Max. exit-way access travel distance	Min. fire-resistance rating of exitway enclosure	Min. fire-resistance rating of opening protection
R-2 (Residential, multi-family)	2 stories	4 dwelling units per floor	50 ft.	1 hour	1 hour
B (Business)	2 stories	3000 sq. ft. per floor	75 ft.	1 hour	1 hour

**Note 1.** Areas complying with definition for basements shall not be counted as a story.

**609.4 Emergency escape:** Every sleeping room below the fourth (4th) story shall have at least one (1) operable window or exterior door approved for emergency egress or rescue. The units must be operable from the inside opening without the use of separate tools. Where windows are provided as a means of egress or rescue they shall have a sill height not more than forty-four (44) inches above the floor. All egress or rescue windows from sleeping rooms must have a minimum net clear opening of five and seven-tenths (5.7) square feet. The minimum net clear opening height dimension shall be twenty-four (24) inches. The minimum net clear opening width dimension shall be twenty (20) inches.

Bars, grills or screens placed over emergency escape windows shall be releasable or removable from the inside without the use of a key, tool or excessive force.

**Exception:** Grade floor windows may have a minimum net clear opening of five (5) square feet.

**609.5 Open parking structures:** Parking structures shall have not less than two (2) exitways from each parking tier, except that where vehicles are mechanically parked, only one (1) exitway need be provided. The maximum distance from any point on a parking tier to an exitway at that

tier shall not exceed three hundred (300) feet. Unenclosed vehicle ramps may be considered as required exitways if pedestrian facilities are provided. Interior exitway stairways need not be enclosed.

## **SECTION 610.0 EXITWAY ACCESS PASSAGEWAYS AND CORRIDORS**

**610.1 Access passageways:** Direct exitway access shall be provided to required exitways through continuous passageways, aisles or corridors, conveniently accessible to all occupants and maintained free of obstruction.

**610.1.1 Turnstiles and gates:** Access through turnstiles, gates, rails or similar devices shall not be permitted unless such a device is equipped to readily swing in the exiting direction of travel under a total pressure of not more than fifteen (15) pounds.

**610.1.2 Restrictions:** The required width of passageways, aisles or corridors shall be maintained free of projections and restrictions except doors opening into such spaces may reduce the clear width to not less than one-half ( $\frac{1}{2}$ ) the required width. When fully open the door may project not more than seven (7) inches into the required width.

**610.2 Dead ends:** Exitway access passageways and corridors in all stories which serve more than one (1) exitway shall provide direct connection to such exitways in opposite directions from any point in the passageway or corridor, insofar as practicable. The length of a dead end corridor shall not be more than twenty (20) feet.

**610.3 Width:** The unit of egress width and occupancy allowance of aisles and corridors, unless otherwise provided for special uses and occupancies in Article 4, shall comply with Table 608 with a minimum total width of forty-four (44) inches except in institutional (I) buildings used for the movement of beds which shall be ninety-six (96) inches; in schools with more than one hundred (100) occupants which shall be seventy-two (72) inches; in one- and two-family dwellings which shall be thirty-six (36) inches; and in churches and chapels, side aisles may be one-half ( $\frac{1}{2}$ ) the width but not less than thirty-two (32) inches clear.

**610.4 Enclosures:** All corridors serving as exitway access shall be enclosed in fire separation walls having a fire resistance rating of at least one (1) hour when serving an occupancy load greater than thirty (30).

**610.4.1 Opening protectives:** All door assemblies from rooms opening onto a corridor required to be of one (1) hour fire resistance rated construction shall be self closing or automatic closing by smoke detection, with a twenty (20) minute fire protection rating when tested in accordance with ASTM E152 listed in Appendix G without the hose stream and labeled and listed by an independent, approved agency.



All door assemblies from rooms opening onto a corridor, required by Table 214 to be of two (2) hour fire-resistance rated construction, shall be one and one-half (1½) hour fire doors.

#### **SECTION 611.0 GRADE PASSAGEWAYS USED AS AN EXITWAY ELEMENT**

**611.1 Passageways:** Every required interior and exterior exitway element which does not adjoin a public way shall be directly connected to the public way or to an open court leading to the public way by an enclosed grade passageway or other unobstructed exitway element constructed as provided in this section.

**611.2 Vestibule:** An exitway may discharge into an interior vestibule used for ingress and egress only and which complies with the following:

1. the vestibule depth from the exterior of the building is not greater than ten (10) feet and the width is not greater than twenty (20) feet; and
2. the vestibule is separated from the remainder of the level of discharge by self-closing doors and the equivalent of one-quarter (¼) inch thick wired glass in steel frames.

**611.3 Lobby:** An exitway may discharge into an interior lobby which shall be provided with an automatic fire suppression system and any other portion of the floor with access to the lobby shall be provided with an automatic fire suppression system or shall be separated therefrom in accordance with the requirements for the enclosure of exitways.

**611.4 Width and height:** The effective width of the passageway shall be not less than three-quarters (¾) of the aggregate width of all required exitway stairways leading thereto and all required exitway doorways opening into the passageway. Such passageway shall have a minimum width of forty-four (44) inches and a minimum clear ceiling height of eight (8) feet.

**611.5 Maximum stairway limitations:** Not more than fifty (50) per cent of the required stairways shall discharge through the same passageway.

#### **SECTION 612.0 MEANS OF EGRESS DOORWAYS**

**612.1 General:** The requirements of this section shall apply to all doorways serving as a component or element of a means of egress; except that this section shall not apply to doorways leading to or from required stairways (see Sections 616.6, 618.4 and 619.3).

**612.2 Number of doorways:** Every room or tenant space with an occupancy load of more than fifty (50) or which exceeds two thousand (2,000) square feet in area shall have at least two (2) egress doorways

leading from the room or tenant space to an exitway or corridor. All doors shall swing in the direction of egress travel when serving an occupancy load of fifty (50) or more or a high hazard occupancy.

**Exception:** One- and two-family dwellings.

**612.2.1 Entrance and egress doorways:** Where separate doors are provided for entrance and egress use, the entrance door shall be clearly marked *Entrance only* in letters not less than six (6) inches in height and legible from both inside and outside.

**612.3 Size of doors:** The minimum width of single door openings shall provide a clear width of not less than thirty-two (32) inches except in one- and two-family dwellings (use groups R-3 and R-4) the clear width shall be not less than twenty-eight (28) inches. The maximum width shall be forty-eight (48) inches nominal. Means of egress doors in institutional buildings (use group I) used for the movement of beds shall be at least forty-four (44) inches wide. When the doorway is subdivided into two (2) or more separate openings, the minimum clear width of one (1) opening shall be not less than thirty-two (32) inches, and each opening shall be computed separately in determining the number of required units of egress width. A door forty (40) inches in width shall be deemed the equivalent of two (2) full units of egress width. The height of doors shall not be less than six and two-thirds ( $6\frac{2}{3}$ ) feet except in one- and two-family dwellings (use groups R-3 and R-4) the height of doors shall be not less than six and one-half ( $6\frac{1}{2}$ ) feet.

**612.4 Location of doors:** The required doorways opening from a room or space within a building and leading to an exitway access shall be located as remote as practicable from each other. The distance of exitway access travel from any point in a room or space to a required exitway door shall not exceed the limitations of Section 607.4.

#### **612.5 Door hardware**

**612.5.1 Operation:** All egress doors shall be readily opened from the side from which egress is to be made without the use of a key or special knowledge or effort except for special institutional uses as indicated in Section 612.5.3. Except for dwelling units, draw bolts, hooks and other similar devices shall be prohibited on all egress doors, unless there is a readily visible, durable sign on the door stating "This door to remain unlocked during occupancy." The sign shall be in letters not less than one (1) inch high on a contrasting background. The locking device must be of a type that will be readily distinguishable as locked. The use of manually operated flush bolts or surface bolts is prohibited.

Double cylinder dead bolts requiring a key operation on both sides are prohibited on required means of egress in use group R (residential) occupancies.

**612.5.2 Panic devices:** All doors equipped with latching devices, in buildings of use group A (assembly) with an occupant load greater than forty nine (49) shall be equipped with approved panic hardware. Acceptable panic hardware will be a device which causes the door latch to release when a force of fifteen (15) pounds is applied in the direction of egress to a bar or panel extending not less than one-half ( $\frac{1}{2}$ ) of the width of the door and at a height greater than thirty (30) inches but less than forty-four (44) inches above the floor.

**612.5.3 Remote control:** In rooms of use group I-1 (institutional, restrained) occupied as places of detention, approved releasing devices with remote control shall be provided for emergency use unless otherwise specifically approved.

**612.5.4 Mechanical operations:** All doors which open into enclosed exitway stairs, exitway passageways or those which are installed to provide fire or smoke barriers across corridors shall be self-closing and be so maintained, or shall be automatic doors which will close upon activation of an approved smoke detector. Where egress doors are arranged to be opened by non-power operated mechanical devices of any kind, they shall be so constructed that the door may be opened manually and will release under a total pressure of not more than fifteen (15) pounds applied in the direction of egress travel. Power operated exitway doors shall be capable of being opened with not more than fifty (50) pounds pressure applied at the normal door knob location when power is lost.

**612.6 Door construction:** All required egress doors that serve as an element of an exitway shall be self-closing or automatic except for grade floor exitway discharge doors and revolving exitway doors.

**612.6.1 Grade exitway discharge doors:** Doors at grade may be glazed with plate glass not less than seven thirty-seconds ( $\frac{7}{32}$ ) inch thick, or with any other approved glazing materials. Approved doors having one (1) or more unframed edges may be used, provided they are constructed of safety glazing not less than one-half ( $\frac{1}{2}$ ) inch thick.

**612.7 Doorway grading:** From each grade floor exitway required by Section 315.0 for the physically handicapped and aged, there shall be provided, after exiting the structure, a hard surfaced area a minimum of forty-eight (48) inches in width centered at the thirty-two (32) inch minimum required opening and extending to a property line adjoining a public street or alley or a point which is a minimum of ten (10) feet clear from any part of the structure. At the exit door, the level of the exterior surface shall not be elevated from the floor inside the door, nor shall it be more than two (2) inches below the floor inside the door. A grade floor exitway shall not have a threshold greater than one-half ( $\frac{1}{2}$ ) inch high, with beveled edges. The floor and exterior surface shall not have a grade of more than two (2) per cent for a distance of five (5) feet either side

of the door. The remainder of the required exterior hard surfaced area shall have, in the direction of existing, an elevating gradient not greater than five (5) per cent. Such walks shall be of a continuing common surface not interrupted by steps or abrupt changes in grade.

**Exception:** One- and two-family dwellings (use groups R-3 and R-4) and use group T.

**612.8 Door arrangement:** Doors in series shall have a space between them of not less than seven (7) feet when measured in their closed positions.

**Exception:** Power operated doors, one- and two-family dwellings (use groups R-3 and R-4) and use group T.

### SECTION 613.0 REVOLVING DOORS

**613.1 Limitations of use:** Revolving doors shall not be used as exitway doors.

**613.2 Speed control:** All approved automatic collapsible revolving doors shall be equipped with an approved speed control governor adjustable to safe traffic speed as required by the approved rules, but not more than fifteen (15) nor less than ten (10) revolutions per minute.

**613.3 Construction:** All approved automatic collapsible revolving doors shall be constructed as indicated in the following Sections 613.3.1 through 613.3.4.

**613.3.1 Operating mechanism:** The collapsing mechanism shall be constructed of stainless steel or other approved corrosion-resistive materials.

**613.3.2 Use of wood:** The doors may be constructed of wood or other approved materials of similar combustible characteristics with a minimum thickness of one and one-quarter ( $1\frac{1}{4}$ ) inches.

**613.3.3 Floor covering:** Approved mats or other floor coverings, not more than one-half ( $\frac{1}{2}$ ) inch thick, may be installed within the enclosure when permanently secured to the structural flooring and finishing flush with the adjacent floor area.

**613.3.4 Glazing:** The doors shall be glazed with approved safety glazing.

### SECTION 614.0 HORIZONTAL EXITS

**614.1 General:** Horizontal exits as herein defined shall be accepted as an approved element of a required means of egress when complying with the requirements of this article. The connection between the areas of refuge as herein specified may be accomplished by protected openings in a

fireresistance rated wall, by a vestibule, or by an open-air balcony or bridge.

**614.2 Separation:** The separation between fire areas shall be provided by at least a two (2) hour fireresistance rated fire wall or fire separation wall complying with Article 9 and Table 214.

**614.2.1 Opening protectives:** All fire doors in horizontal exits are to be self-closing or automatically closing when activated by an approved smoke detector. All doors shall swing in the direction of egress travel. When serving as a dual element of a means of egress, there shall be adjacent openings with swinging fire doors opening in opposite directions.

**614.3 Size of doors:** Size of openings in fire walls shall comply with the provisions of Section 908.0, but the width of one (1) opening used as a required exit shall not be greater than eighty-eight (88) inches nor shall the area exceed eighty (80) square feet.

**614.4 Area of refuge:** The discharge area of a horizontal exit shall be either public areas or spaces occupied by the same tenant and each such area of refuge shall be adequate to house the total occupancy load of both connected areas. The capacity of areas of refuge shall be computed on a net floor area allowance of three (3) square feet for each occupant to be accommodated therein except for non-ambulatory institutional areas which shall be thirty (30) square feet per occupant, not including areas of stairs, elevators and other shafts or courts.

**614.5 Unlocked doors:** Horizontal exit doors shall be kept unlocked and unobstructed whenever the area on either side of the horizontal exit is occupied.

#### **614.6 Egress from area of refuge**

**614.6.1 Stairway exitway:** In multi-story buildings, there shall be at least one (1) interior enclosed stairway or smokeproof enclosure on each side of the horizontal exit, and any fire area not having a stairway accessible thereto shall be considered as part of an adjoining section with such stairway; but the length of exitway access travel distance to the horizontal exit or the required exitway shall not exceed the requirements of Section 607.4.

**614.6.2 Auxiliary elevator:** When horizontal exits are provided in floors located twelve (12) or more stories above grade, the required stairway shall be supplemented by at least one (1) passenger elevator maintained ready for use during normal occupancy of the building.

### **SECTION 615.0 EGRESS RAMPS**

**615.1 Capacity:** The capacity of ramps used as an egress component shall be computed in accordance with Section 608.0.

## **615.2 Minimum dimensions**

**615.2.1 Width:** The minimum width of an egress ramp shall be not less than that required for corridors by Section 610.3.

**615.2.2 Headroom:** The minimum headroom in all parts of the egress ramp shall be not less than six and two-thirds ( $6\frac{2}{3}$ ) feet.

**615.2.3 Restrictions:** Egress ramps shall not reduce in width in the direction of egress travel. Projections into the required ramp and landing width are prohibited except for handrails and stringers. Doors opening onto a landing shall not reduce the clear width to less than forty-two (42) inches.

**615.3 Landings:** Landings shall be provided at all points of turning, entrance, exiting and doors. Ramp slopes greater than one (1) in fifteen (15) shall have landings at the top, bottom and each five (5) feet of vertical rise. Each landing shall have a minimum length of five (5) feet except the bottom landing shall have a length of six (6) feet.

**615.4 Maximum slope:** A ramp used for egress for the physically handicapped shall have a maximum slope of one (1) in twelve (12). All other egress ramps shall have a maximum slope of one (1) in eight (8).

**615.4.1 Surface:** For all slopes exceeding one (1) in twelve (12), and wherever the use is such as to involve danger of slipping, the ramp shall be surfaced with approved non-slip materials.

**615.5 Handrails:** Handrails shall be provided on at least one (1) side of every ramp having a slope greater than one (1) in fifteen (15), and they shall be not less than thirty (30) inches nor more than thirty-four (34) inches in height, measured from the surface of the ramp. Handrails shall be smooth and shall extend one (1) foot beyond the top and bottom of the ramp and return to walls or posts at the ends.

**615.6 Ramp construction:** Ramps used as an exitway shall conform to the applicable requirements of Section 616.9 as to materials of construction and enclosure.

## **SECTION 616.0 INTERIOR EXITWAY STAIRWAYS**

**616.1 Capacity:** The capacity of stairways and doors per unit of exit width shall be computed in accordance with Section 608.0.

### **616.2 Minimum dimensions**

**616.2.1 Width:** All interior exitway stairways shall be not less than forty-four (44) inches in width, except that such width may be reduced to thirty-six (36) inches when serving an occupancy load of fifty (50) or less.

**616.2.2 Headroom:** The minimum headroom in all parts of the stair enclosure shall be not less than six and two-thirds ( $6\frac{2}{3}$ ) feet measured

vertically from the tread nosing or from the floor surface of the landing or platform.

**616.2.3 Restrictions:** Stairways shall not reduce in width in the direction of exit travel. Projections into a stairway are prohibited except for handrails as indicated in Section 616.5.1 and for stairway stringers which may project not more than one and one-half (1½) inches.

### 616.3 Landings and platforms

**616.3.1 Width:** The least dimension of landings and platforms shall be not less than the required width of stairway.

**616.3.2 Vertical rise:** In all buildings a stairway shall not have a height of vertical rise of more than twelve (12) feet between landings and intermediate platforms.

### 616.4 Treads and risers

**616.4.1 Minimum dimensions:** The height of risers and width of treads in inches shall be as indicated in the following Table 616.

**Table 616**  
**TREAD AND RISER SIZE<sup>1</sup>**

Use group	Maximum riser	Minimum tread
Assembly and institutional <sup>2</sup>	7½"	10"
One and two family dwellings	8¼"	9"
All others <sup>2</sup>	8"	9"

**Note 1.** Within any flight, a three-sixteenths (3/16) inch maximum variation in riser height or tread width is permitted.

**Note 2.** Except in one and two family dwellings, tread and riser shall be so proportioned that the sum of two (2) risers plus one (1) tread, exclusive of nosing, is not less than twenty-four (24) nor more than twenty-five (25) inches.

**616.4.2 Winders:** Winders shall not be permitted in required exitway stairways except in one- and two-family dwellings and stairways serving a single dwelling unit and in ornamental stairways not required as an element of an exitway. Such winders shall have a tread width of not less than nine (9) inches at a point not more than twelve (12) inches from the side where the tread is narrower and the minimum tread width is not less than six (6) inches.

**616.5 Stairway guards and handrails:** Stairways shall have continuous guards and handrails on both sides, and in addition thereto, stairways more than eighty-eight (88) inches in required width shall have intermediate handrails dividing the stairway into portions not more than eighty-eight (88) inches wide. Stairways in one- and two-family dwellings may have one (1) handrail.

**616.5.1 Handrail details:** Handrails shall be provided according to the following requirements.



1. Handrails may project not more than three and one-half ( $3\frac{1}{2}$ ) inches into the required stair width.
2. Handrails shall be not less than thirty (30) inches, nor more than thirty-four (34) inches, measured vertically, above the nosing of the treads.
3. Handrails shall extend eighteen (18) inches beyond the top and bottom step if a guard or wall exists and shall be returned to walls or posts at the ends of the stairways.
4. Handrails shall be designed to withstand an applied load of two hundred (200) pounds in any direction at any point.

**616.5.2 Guard details:** Guards shall be provided according to the following requirements.

1. Guards shall be not less than forty-two (42) inches in height measured vertically above the nosing of the tread.  
**Exception:** Guards shall be not less than thirty (30) inches in height measured vertically above the nosing of the tread along stairs which:
  - a. do not exceed twenty (20) feet in height; or
  - b. reverse direction at intermediate landings with twelve (12) inches or less measured horizontally between successive flights.
2. Guards shall be constructed so that the area in the plane of the guard, from the top of the tread to the top of the guard, is subdivided or filled in one (1) of the following methods:
  - a. a sufficient number of intermediate longitudinal rails constructed so that the clear distance between rails (measured at right angles to the rail) does not exceed six (6) inches. The bottom rail shall not be more than six (6) inches (measured vertically) from the tread nosing; or
  - b. balusters spaced not more than six (6) inches apart; or
  - c. panels of wire mesh, or expanded metal, or ornamental grills which provide protection equivalent to that provided by the intermediate rails or balusters specified in the two (2) preceding paragraphs; or
  - d. walls; or
  - e. any combination of the foregoing.
3. Guards at least forty-two (42) inches in height shall be located along open-sided floor areas, mezzanines and landings.

**Exception:** In R-3 and R-4 occupancies, guards shall be at least thirty-six (36) inches in height.

## **616.6 Stair exitway doors**

**616.6.1 Width:** The width of every exitway door to or from a stairway shall be not less than the number of units of exit width required for the capacity of the stairway which services the floor or area from which the



exitway door leads; but such a door shall not be less than twenty-eight (28) inches in clear width in use group R-3 buildings (one- and two-family dwellings), nor less than thirty-two (32) inches in clear width in all other use groups.

**616.6.2 Direction of swing:** All doors shall swing on a landing in the direction of exit travel. When opening, stair exitway doors shall not reduce the width of landings to less than one-half ( $\frac{1}{2}$ ) the minimum required for its capacity. When fully open, the exitway door may project seven (7) inches onto the landing.

**616.6.3 Door construction:** All doorway opening protectives, including the frames and hardware, shall be approved self-closing, swinging fire doors, except in one- and two-family dwellings where one and three-quarters ( $1\frac{3}{4}$ ) inch solid core wood doors are permitted. Labeled fire doors shall have a maximum transmitted temperature end point of not more than four hundred fifty (450) degrees F. above ambient at the end of thirty (30) minutes of standard fire test exposure.

**616.7 Spiral stairways:** Spiral stairways of noncombustible construction may be used as an element of a means of egress in one- and two-family dwellings and within a single dwelling unit and from a mezzanine area not more than two hundred fifty (250) square feet in area and serving not more than five (5) occupants. The minimum width shall be twenty-six (26) inches with each tread having a seven and one-half ( $7\frac{1}{2}$ ) inch minimum tread width at twelve (12) inches from the narrow edge. All treads shall be identical and the rise shall be not more than nine and one-half ( $9\frac{1}{2}$ ) inches. A minimum headroom of six and one-half ( $6\frac{1}{2}$ ) feet shall be provided.

**616.7.1 Circular stairways:** Circular stairways may be used as an element of egress when a minimum tread width of ten (10) inches is provided and the smaller radius is not less than twice the width of the stairway.

**616.8 Supplemental stairways:** Stairways which are not a required means of egress element, serving one (1) adjacent floor and not connected with a corridor or stairway serving other floors, may be used in all use groups except institutional (use group I).

**616.9 Stairway construction:** Unless herein otherwise provided, all required interior stairways shall be built entirely of noncombustible materials with solid risers, treads and landing platforms and all finish floor surfaces of non-slip noncombustible materials; except that wood handrails shall be permitted, complying with the requirements of Section 616.5.

**616.9.1 Strength:** All stairways, platforms, landings and exitways in other than one- and two-family dwellings, shall be adequate to support a live load of one hundred (100) pounds per square foot (psf) and a concentrated load of three hundred (300) pounds.

**616.9.2 Enclosures:** Required interior exitway stairways shall be enclosed in fire separation assemblies of the fire resistance rating specified in Table 214. An exitway enclosure shall not be used for any purpose other than means of egress. A space below a stairway shall be enclosed as required or kept open. Doors shall not open into the stairway enclosure except exitway doors.

**Exceptions:**

1. Exitways in buildings of use group R-3 (residential, one- and two-family).
2. Exitways serving and contained within a single residential dwelling unit.
3. Exitways in communicating floor levels as provided in Section 616.10.
4. Supplemental stairways as provided in Section 616.8.

**616.9.3 Combustible construction:** In all buildings of Types 3 or 4 construction, the stairways and their enclosures may be constructed of wood or other approved materials of similar characteristics and of adequate strength.

**616.10 Communicating floors:** In any building, other than use groups A-4 (assembly; schools) or I (institutional), with low hazard occupancy (use group S-2), or with ordinary hazard occupancy (use groups B, M, R-1 and R-2) with automatic sprinkler protection where necessary to the effective utilization of a building site with sloping grade or otherwise essential to the functional design of the building, not more than three (3) communicating floor levels may be permitted without enclosure or protection between such areas, only provided all the conditions described below are met.

1. the lowest, or next to the lowest, level is a street floor;
2. the entire area, including all communicating floor levels, is sufficiently open and unobstructed to be assumed that a fire or other dangerous condition in any part will be immediately obvious to the occupants of all communicating levels and areas;
3. egress capacity is simultaneously sufficient for all the occupants of all communicating levels and areas, all communicating levels in the same fire area being considered as a single floor area for purposes of determination of required egress capacity; and
4. each floor level, considered separately, has at least one-half ( $\frac{1}{2}$ ) of its individual required egress capacity provided by an exitway or exitways leading directly out of that area without traversing another communicating floor level or being exposed to the spread of fire or smoke therefrom.

**616.11 Discharge identification:** Stairways which continue beyond the floor of discharge shall be interrupted at the floor of discharge by parti-

tions, doors or other effective means of preventing persons from continuing past the floor of discharge while egressing. A sign shall be provided at each landing in all interior stairways more than three (3) stories in height designating the floor level above the floor of discharge.

## SECTION 617.0 ACCESS TO ROOF

**617.1 By stairway or ladder:** In buildings more than three (3) stories in height except those with a roof slope greater than four (4) in twelve (12), access to the roof shall be provided by means of a stairway or a ladder and trap door; the ladder shall not be on the exterior of the building. Where the roof is used as a roof garden or for other habitable purposes, sufficient stairways shall extend to it to provide the necessary exitway facilities from the roof as required for such occupancy. Roof trap doors shall be constructed to comply with Section 925.2.

**617.1.1 Optional stairway or ladder:** Buildings not required to have a stairway or ladder to the roof as described above, may include such a stairway or ladder at the discretion of the designer of the building. The stairway or ladder shall conform to the provisions of this section, except that ladders may be placed on the exterior of the building. The siderails of exterior ladders shall be carried over the coping or parapet to afford hand hold; the ladder shall be metal, and if it exceeds twenty (20) feet in height, shall have a protective cage or other safety device; other design details of such exterior ladders are subject to the approval of the building official.

**617.2 Roof enclosures:** Stairways extending through roofs shall be enclosed in roof structures of fire-resistance rated construction meeting the requirements of Section 925.0.

## SECTION 618.0 SMOKEPROOF ENCLOSURES

**618.1 General:** A smokeproof enclosure shall consist of a continuous stairway, enclosed from the highest point to the lowest point, meeting the requirements of this section.

**618.2 Where required:** At least one (1) of the required exitways shall be a smokeproof enclosure in buildings over six (6) stories or seventy-five (75) feet in height when of one (1) of the following use groups:

1. use groups A-2, A-3, A-4, A-5 (assembly other than theaters);
2. use group B (business);
3. use group F (factory and industrial);
4. use group I (institutional);
5. use group M (mercantile); and
6. use group R-1 (residential, hotel).

**618.3 Access:** Exitway access to the stairway at each story shall be through a vestibule or balcony with an unobstructed width not less than

the required stairway width and a minimum dimension of seventy-two (72) inches in the direction of exit travel.

**618.4 Doors:** Door openings from interior spaces to the vestibule or balcony and from the vestibule or balcony to the stairway, shall be as required in Section 612.3. The doors from interior spaces to the vestibule shall have a fireresistance rating not less than one and one-half ( $1\frac{1}{2}$ ) hours and shall comply with the requirements of Section 616.6 for stair exitway doors. The door from the vestibule to the stairway shall be a tight-fitting door, equal to not less than an exterior type solid wood door without voids, assembled with exterior type glue, one and three-quarter ( $1\frac{3}{4}$ ) inch minimum thickness set in a steel frame. Wired glass, if provided, shall not exceed one hundred (100) square inches in area and shall be set in a steel frame. The door shall be provided with a drop sill and be weather stripped or otherwise provided to minimize air leakage.

**618.5 Terminal passageway:** The smokeproof enclosure shall terminate at grade level and shall provide egress to the street independently of all other exitways. When grade passageways are used, they shall comply with the requirements of Section 611.0, except that there shall not be openings therein other than the smokeproof enclosure and street exit doorways. The passageway walls shall be of four (4) hour fireresistance rated construction, and the floor and roof of three (3) hour fireresistance rated construction.

**618.6 Construction:** The construction of smokeproof enclosures shall be of walls with a four (4) hour fireresistance rating without openings other than the required doorways. The vestibule shall be considered to be an element of the exitway and shall be constructed in accordance with the fireresistance rating requirements of Table 214. The balcony shall be constructed in accordance with the fireresistance rating requirements in Table 214 for floor construction. The stairshaft vestibule or balcony shall be provided with emergency lighting from an approved independent power source to assure continued illumination in case of emergency.

**618.7 Ventilation of smokeproof enclosures:** Smokeproof enclosures shall be ventilated with natural ventilation or mechanical ventilation meeting the requirements of Section 618.8 or 618.9.

**618.8 Smokeproof enclosure by natural ventilation:** The balcony separating the smokeproof enclosure from the interior building spaces shall have at least one (1) open side adjacent to a street, alley, or yard with guard railings across the open side(s). One (1) open side of the balcony shall have a minimum open area of sixteen (16) square feet with any dimension at least thirty (30) inches. The balcony floor shall be level with or installed below the building floor where climatic conditions involve the possibility of door obstruction by snow or ice. A step shall not be permitted between the balcony and the smokeproof enclosure. The street, alley, or yard adjacent to one (1) open side of the balcony shall have a minimum

area of two hundred (200) square feet and a minimum dimension of ten (10) feet.

**618.9 Smokeproof enclosure by mechanical ventilation:** The stairshaft and vestibule shall be provided with a mechanical ventilation system as specified herein that will be automatically activated on three (3) or more floors in case of emergency.

**618.9.1 Operation of ventilating equipment:** Vestibule and stairshaft mechanical ventilation may be inactive or may operate at reduced levels for normal operations, but when the detectors referred to herein either fail or are activated, the vestibule and stairshaft mechanical ventilation systems shall operate at the levels specified in Section 618.9.2 and 618.9.3. The vestibule ventilation system shall be designed and activated in accordance with one (1) of the following methods.

1. Total system: simultaneous operation of all vestibules. If the vestibule mechanical ventilation system is designed to provide the ventilation in the vestibules on all floors simultaneously, a products-of-combustion detector shall be located outside each vestibule so designed that activation or failure of any one (1) of the detectors will simultaneously activate the vestibule ventilation system on all floors.
2. Zoned system: simultaneous operation of three (3) or more vestibules. If the vestibule ventilation system is designed as one (1) or more zones to provide the simultaneous ventilation in the vestibules for at least a three (3) floor zone, automatic supply and exhaust dampers shall be provided in all vestibles in order to obtain the zoned control of the ventilation as follows: a smoke detector shall be located outside each vestibule so designed to open the supply and exhaust duct dampers in the vestibules within the affected zone [three (3) or more floors] and to actuate the stairshaft ventilation system in case any detector in the affected zone either fails or is activated.

**618.9.2 Vestibule ventilation:** The vestibule shall have an emergency ventilating system providing a supply of not less than one (1) air change per minute. The exhaust shall be one hundred fifty (150) per cent of the supply. Supply air and exhaust air shall serve the vestibule through separate tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within six (6) inches of the floor level. The top of the exhaust register shall be located within six (6) inches of the vestibule ceiling and shall be entirely within the smoke trap area. Doors, when in the open position, shall not obstruct the duct openings. Duct openings may be provided with controlling dampers if required by Section 618.9.1 (method 2) but these are not otherwise required. The vestibule ceiling shall be at least twenty (20) inches higher than the door opening into the vestibule, to serve as a smoke trap and to provide an upward moving air column.

Special provision shall be made in the design to avoid creation of negative pressures which would retard the opening of the door to the stairshaft from the vestibule.

**618.9.3 Stairshaft ventilation:** The stairshaft shall be provided with emergency mechanical supply and exhaust air. There shall be a minimum of twenty-five hundred (2500) cubic feet per minute (cfm) discharge at the top of the shaft. The supply shall be sufficient to provide a minimum of five-hundredths (.05) inches of water column pressure above atmospheric pressure with all doors closed and a minimum of ten-hundredths (.10) inch water column difference between the stairshaft and the vestibule. Supply air shall be introduced at the level of the grade exitway discharge.

**618.9.4 Standby power:** Mechanical vestibule stairshaft ventilation systems and detector systems shall be powered by an approved self-contained generator designed to operate whenever there is a loss of power in the normal house current. The generator shall be located in a separate room of two (2) hour fire resistance rated construction and shall have a minimum fuel supply to operate the equipment for two (2) hours.

**618.9.5 Emergency lighting:** The vestibules and stairshaft shall be provided with emergency lighting. The standby generator which is installed for the vestibule and stairshaft mechanical ventilation equipment may be used for the standby emergency lighting power supply.

**618.9.6 Fire protection indicator panel:** A fire protection indicator panel may be required by the building official and, if so, shall be located as near as practical inside the entrance to the smokeproof tower stairshaft at grade. Said panel shall indicate the floor or floors having caused the alarm. Said panel shall have an overriding manual switch capable of deactivating the ventilation equipment.

**618.9.7 Fire department communications connection:** The fire protection indicator panel shall have a direct connection to the fire department facilities if required by the building official.

**618.9.8 Acceptance and testing:** Before the foregoing equipment is accepted by the building official, it shall be tested in his presence to confirm that equipment is operating in compliance with these requirements.

**618.9.9 Building owners' responsibility:** The building engineer shall test all the equipment referred to in these requirements at least once every thirty (30) days and maintain a log attesting to the results. The log shall be available for inspection by the building official and the fire official.

## **SECTION 619.0 EXTERIOR EXITWAY STAIRWAYS**

**619.1 As required exitway:** Exterior stairways conforming to the requirements for interior stairways in all respects, except as to enclosures and except as herein specifically modified, may be accepted as an element of a

required means of egress in buildings not exceeding five (5) stories or sixty-five (65) feet in height for other than use group I (institutional) buildings, except as provided in Section 619.1.1 for residential buildings. Exterior stairways which are accepted as exitway elements shall be relieved from requirements for fire doors, but shall be provided with handrails and guards as required for interior exitway stairs. Exterior stairways in climates subject to snow or ice shall be protected to prevent accumulation of snow and ice.

**619.1.1 Location and arrangement:** Exterior stairways may be utilized where at least one (1) door from each tenant opens onto a roofed-over open porch or balcony served by at least two (2) stairways, except that one (1) stairway may be provided as permitted in Table 609, so located as to provide a choice of independent, unobstructed means of egress directly to the grade. Such porches and stairways shall comply with the requirements for interior exitway stairways as specified in Section 616.0. Porches and balconies shall be not less than four and one-half (4½) feet in width. The stairways shall be located remotely from each other. The maximum travel distance from any tenant space to the nearest stairway shall be as specified in Table 607. Porches and stairways shall be located at least ten (10) feet from adjacent property lot lines and from other buildings on the same lot, unless openings in such buildings are protected by three-quarter (¾) hour fireresistance rated doors or windows.

**619.2 Guards and handrails:** Guards and handrails shall be as specified in Section 616.0.

**619.3 Opening protectives:** Openings below and within ten (10) feet horizontally of the stairway shall be protected with approved three-quarter (¾) hour fireresistance rated automatic opening protectives.

**Exception:** Buildings two (2) stories or less in height.

#### **619.4 Location**

**619.4.1 Access to street:** All required exterior stairways shall be located so as to lead directly to a street or open space with direct access to a street; or when located on the rear of the building may lead through a passageway at grade complying with Section 611.0.

**619.4.2 Projection:** Exterior stairways shall not project beyond the street lot line.

**619.5 Construction:** Exterior stairs, porches and balconies shall be constructed of materials consistent with the types of materials permitted in Table 214 for the type of construction of the building to which the stairway is attached.



## SECTION 620.0 MOVING EXITWAY STAIRWAYS

**620.1 When acceptable:** Moving stairways of the horizontal non-slip tread type moving in the direction of egress may be accepted as an approved exitway element in buildings of all use groups except assembly (A) and institutional (I) uses, when constructed and approved in accordance with the requirements of this article and the provisions of Section 1619.0. When accepted as an element of a required means of egress, they shall be enclosed with fireresistance rated partitions as specified in Section 616.0.

**620.2 Width:** The width shall be not less than forty (40) inches between guards and the moving tread shall be not less than thirty-six (36) inches in width, and fifteen and three-quarter ( $15\frac{3}{4}$ ) inches in depth.

**620.3 Capacity:** The occupancy capacity shall be computed as provided in Section 608.0 for exitway stairways.

**620.4 Landings and platforms:** Landings and platforms shall be provided at the top and bottom of each unit as required for interior exitway stairways.

**620.5 Railings:** Guards shall be surmounted with moving handrails traveling at the same speed as the stairway.

**620.6 Egress:** Means of egress to the street shall be provided as specified herein for interior stairways.

### 620.7 Construction

**620.7.1 Noncombustible materials:** Only noncombustible materials shall be used in the construction of moving stairways accepted as a required means of egress except for step wheels, handrails, electrical equipment, and wood veneers not more than one twenty-eighth ( $\frac{1}{28}$ ) inch thick directly attached to metal or other noncombustible backing with a nonvolatile and nonflammable cement.

**620.7.2 Fireresistance:** The enclosure shall afford the fireresistance rating required for approved interior exitway stairways as specified in Section 616.9.

**620.7.3 Height of travel per unit:** A single moving stairway unit shall not have a vertical travel of more than two (2) stories nor more than thirty-five (35) feet.

## SECTION 621.0 FIRE ESCAPES

**621.1 Where permitted:** Fire escapes shall not be permitted as an element of a required means of egress except on existing buildings or structures when constructed in accordance with the approved rules and when more adequate exitway facilities cannot be provided. Fire escapes shall not provide more than fifty (50) per cent of the required exit capacity.



**621.2 Location:** When located on the front of the building and projecting beyond the building line, the lowest landing shall be not less than seven (7) or more than twelve (12) feet above grade, equipped with a counter-balanced stairway to the street. In alleyways and thoroughfares less than thirty (30) feet wide, the clearance under the lowest landing shall be not less than twelve (12) feet.

**621.3 Construction:** The fire escape shall be designed to support a live load of one hundred (100) pounds per square foot (psf), and shall be constructed of steel or other approved noncombustible materials. Fire escapes may be constructed of wood not less than two (2) inches thick on buildings of Type 4 construction.

**621.3.1 Dimensions:** Stairs shall be at least twenty-two (22) inches wide with risers not more and treads not less than eight (8) inches and landings at foot of stairs not less than forty (40) inches wide by thirty-six (36) inches long, located not more than eight (8) inches below the access window or door.

**621.3.2 Opening protectives:** Doors and windows along the fire escape shall be protected with three-quarter ( $\frac{3}{4}$ ) hour fireresistance rated opening protectives.

## SECTION 622.0 SLIDESCAPES

**622.1 Where permitted:** Slidescapes and safety chutes shall be permitted in buildings of the high hazard use group, and in existing school and institutional buildings, when approved by the building official and constructed in accordance with the approved rules.

**622.2 Location:** The arrangement and location of slidescapes shall conform to this article for means of egress and shall be designated by exit signs and lights as provided in Section 623.0.

**622.3 Construction:** All chutes shall be constructed of approved non-combustible materials with a pitch in the line of travel of not less than twenty-four (24) nor more than forty-two (42) degrees measured on the developed circumference of spiral chutes. Straight chutes shall be not less than twenty-four (24) inches and spiral chutes not less than twenty-eight (28) inches wide in the clear; nor more than forty-four (44) inches wide in any case. When erected on the interior of a building, they shall be enclosed as required in Section 616.9 for interior stairways with direct means of egress to the street or other public space.

**622.4 Capacity:** Slidescapes, where permitted as an element of a required exitway, shall be rated at one (1) unit of egress width per slide, with rated capacity of sixty (60). Slidescapes, except as permitted for high hazard manufacturing buildings or structures, shall not constitute more than twenty-five (25) per cent of the required number of units of egress width from any building or structure or any individual story.

### SECTION 623.0 EXIT SIGNS AND LIGHTS

**623.1 Location:** In all buildings having an occupancy load of fifty (50) or more all required means of egress shall be indicated with approved internally illuminated signs reading *Exit* visible from the exitway access and, when necessary, supplemented by directional signs in the access corridors indicating the direction and way of egress. All Exit signs shall be located at exitway doors or exitway access areas, so as to be readily visible.

**623.2 Size and color:** Exit signs shall have red letters at least six (6) inches high and the minimum width of each stroke shall be three-quarter ( $\frac{3}{4}$ ) inch on a white background or in other approved distinguishable colors. If an arrow is provided as part of an exit sign, the construction shall be such that the arrow direction can not be readily changed. The letters *Exit* shall be clearly discernible when the internally illuminated sign is not energized.

**623.3 Illumination:** Each sign shall be illuminated by a source providing not less than five (5) foot-candles at the illuminated surface.

**623.4 Power source:** All Exit signs shall be illuminated at all times, when the building is occupied, from an emergency electrical system.

### SECTION 624.0 MEANS OF EGRESS LIGHTING

**624.1 Artificial lighting:** All means of egress in other than one- and two-family dwellings shall be equipped with artificial lighting facilities to provide the intensity of illumination herein prescribed continuously during the time that conditions of occupancy of the building require that the exitways be available. Lighting shall also be provided to illuminate the exitway discharge.

**624.2 Intensity of illumination:** The intensity of floor lighting shall be not less than three (3) foot candles.

**624.3 Places of assembly:** In places of assembly for the exhibition of motion pictures or other projections by means of directed light, the illumination of floors of exitway access areas may be reduced during such period of projection to not less than one (1) foot candle.

**624.4 Emergency lighting system:** Means of egress lighting shall be provided from an independent power source or other approved auxiliary source of power to assure continued illumination in case of emergency or primary power loss for a duration of one (1) hour in the following:

1. use group A (public assembly);
2. use group B (business) containing more than one thousand (1,000) occupants;

3. use group I (institutional);
4. use group M (mercantile) when greater than three thousand (3,000) square feet in area on any floor or when having one (1) or more floors above or below grade floor;
5. use group R-1 (hotels) containing more than twenty-five (25) sleeping rooms;
6. use group R-2 (multi-family dwellings) containing more than fifty (50) occupants; and
7. in all windowless buildings or portions thereof regardless of use group, except R-3.

#### SECTION 625.0 HAZARDS TO MEANS OF EGRESS

**625.1 Floor openings:** Manholes or floor access panels shall not be located in the line of egress which reduce the clearance to less than thirty-two (32) inches.

**625.2 Protrusions:** There shall not be low-hanging door closers that remain within the opening of a doorway when the door is open or that protrude hazardously into corridors or line of egress when the door is closed. There shall not be low-hanging signs, ceiling lights or similar fixtures which protrude into corridors or lines of egress.

**625.3 Identification of hazardous exits:** Doors leading to dangerous areas such as fire escapes, loading platforms, switch rooms and mechanical rooms shall be equipped with knobs, handles or push bars that have been knurled.

**625.4 Floor surfaces:** All floors of corridors and lines of egress shall have a surface that is non-slip.



# ARTICLE 7

## STRUCTURAL AND FOUNDATION LOADS AND STRESSES

### SECTION 700.0 GENERAL

**700.1 Scope:** The provisions of this article shall control the structural design of all buildings and structures, and their foundations, hereafter erected to insure adequate strength of all parts thereof for the safe support of all superimposed live and special loads in addition to their own dead load, without exceeding the allowable stresses or design capabilities. The loads specified herein are the minimum suitable for use with stresses and load factors prescribed in this code or in accepted engineering practice.

### SECTION 701.0 DESIGN SAFE LOAD

**701.1 Safe support required:** Buildings or other structures, and all parts thereof, shall be designed and constructed to support safely all loads, including dead loads, without exceeding the allowable stresses (or ultimate strengths when appropriate load factors are applied) for the materials of construction in the structural members and connections, except as provided in Sections 702.0 and 802.0 for test assemblies not capable of analysis. When both wind and earthquake loads are present, only that one which produces the greater stress need be considered, and both need not be assumed to act simultaneously.

**701.2 Progressive collapse:** Buildings and structural systems shall provide such structural integrity that the hazards associated with progressive collapse, such as that due to local failure caused by severe overloads or abnormal loads not specifically covered herein, are reduced to a level consistent with good engineering practice.

**701.3 Load tests:** The building official may require a load test or he shall accept certified reports of such tests from accredited testing authorities conducted in accordance with the approved rules, of any construction, whenever there is reason to question its safety for the intended occupancy or use.

## SECTION 702.0 TEST SAFE LOAD

**702.1 When required:** When not capable of design by accepted engineering analysis, any system of construction or structural unit and its connections shall be subjected to the tests prescribed in Article 8 or in the test standards listed in Appendices D and E, or to such other tests acceptable to the building official that simulate the actual loads and conditions of application that occur in normal use; or he shall accept certified reports of such tests conducted by an accredited testing laboratory, providing such tests meet the requirements of this code and the approved rules.

**702.2 Test load:** When approved by test, every structural assembly shall sustain without failure minimum superimposed loads equal to two and one-half ( $2\frac{1}{2}$ ) times the required live load; and under the approved working load, the deflection shall not exceed the limits prescribed in Section 803.0.

## SECTION 703.0 DESIGN LIVE LOAD

**703.1 Required live load:** The live loads to be assumed in the design of buildings and structures shall be the greatest load produced by the intended use and occupancy, but not less than the minimum uniformly distributed unit loads required in Section 706.0 for specific uses.

**703.2 Loads not specified:** The building official shall approve the required live load for any use not specifically provided for in Table 706.

## SECTION 704.0 DESIGN DEAD LOAD

**704.1 Weights of materials and constructions:** In estimating dead load for the purposes of structural design, the actual weights of materials and constructions shall be used, but not less than the unit dead loads prescribed in Appendix J and the standard for Minimum Design Loads in Buildings and Other Structures listed in Appendix B. In the absence of definite information, any values assumed by the designers shall be subject to the approval of the building official.

**704.2 Weight of fixed service equipment:** In estimating dead loads for purposes of design, the weight of fixed service equipment; such as plumbing stacks and risers, electrical feeders, heating, ventilating, air conditioning and sprinkler systems shall be included.

**704.3 Partition load:** In office and other buildings, in which subdividing partitions may be subsequently erected, rearranged or relocated, provision shall be made to support the actual weight of such partitions where they occur, or for an equivalent uniform load, which shall be assumed not less than twenty (20) pounds per square foot (psf) of floor area, in addition to the specified uniformly distributed live load. Provision for partitions weight

shall be made whether or not partitions are shown on the plans, unless the specified live load exceeds eighty (80) psf.

### SECTION 705.0 EXISTING BUILDINGS

**705.1 General:** In the reconstruction, repair, extension or alteration of existing buildings, the allowable working stresses used in design shall be as indicated in the following Sections 705.2 through 705.5.

**705.2 Building extended:** When an existing building is altered by an extension in height or area, all existing structural parts affected by the addition shall be strengthened where necessary, and all new structural parts shall be designed to meet the requirements for buildings hereafter erected.

**705.3 Building repaired:** When repairs are made to the structural portion of an existing building, and the uncovered structural portions are found unsound, such parts shall be made to conform to the requirements for buildings hereafter erected.

**705.4 Existing live load:** When an existing building heretofore approved is altered or repaired within the limitations prescribed in Sections 106.4 or 106.5, the structure may be designed for the loads and stresses applicable at the time of erection, provided the public safety is not endangered thereby.

**705.5 Posted live load:** Any existing building heretofore approved, in which there is not a change in use to a new use group requiring greater floor loads, may be posted for the originally approved live loads, provided the building is structurally safe in all its parts and adequate for its existing use, and the public safety is not endangered thereby.

### SECTION 706.0 UNIFORMLY DISTRIBUTED LIVE LOADS

**706.1 Uniform live load:** The minimum uniformly distributed live load in pounds per square foot (psf) shall be as provided in Table 706, and for all concentrated loads wherever they occur as provided in Section 707.0.

**706.2 Posting of live loads:** In every building or other structure or part thereof, used for mercantile, business, industrial or storage purposes, the design loads shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or his duly authorized agent, in a conspicuous place in each space to which they relate. Any plates lost, removed, or defaced, shall be replaced by the owner or his agent.

**Table 706**  
**MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS**

Occupancy or use	Live load (psf)
Apartments (see Residential)	150
Armories and drill rooms	150
Assembly halls and other places of assembly:	
Fixed seats	60
Movable seats	100
Platforms (assembly)	100
Balcony (exterior)	100
One- and two- family dwellings only	60
Bowling alleys, poolrooms, and similar recreational areas	75
Cornices	75
Court rooms	100
Corridors:	100
First floor	
Other floors, same as occupancy served except as indicated	100
Dance halls and ballrooms	100
Dining rooms and restaurants	100
Dwellings (see Residential)	
Fire escapes	100
On multi- or single-family residential buildings only	40
Garages (passenger cars only)	50
For trucks and buses use AASHO <sup>1</sup> lane loads (see Table 707 for concentrated load requirements)	
Grandstands (see Reviewing stands)	
Gymnasiums, main floors and balconies	100
Hospitals	
Operating rooms, laboratories	60
Private rooms	40
Wards	40
Corridors, above first floor	80
Hotels (see Residential)	
Libraries:	
Reading rooms	60
Stack rooms (books & shelving at 65 pcf) but not less than	150
Corridors, above first floor	80
Manufacturing:	
Light	125
Heavy	250
Marquees	75
Office buildings:	
Offices	50
Lobbies	100
Corridors, above first floor	80
File and computer rooms require heavier loads based upon anticipated occupancy	
Open parking structures (passenger cars only)	50
Penal institutions:	
Cell blocks	40
Corridors	100
Residential:	
Multifamily houses	
Private apartments	40
Public rooms	100
Corridors	80



# STRUCTURAL AND FOUNDATION LOADS AND STRESSES

**Table 706 (cont'd.)**  
**MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS**

Occupancy or use	Live load (psf)
Dwellings:	
First floor	40
Second floor and habitable attics	30
Uninhabitable attics <sup>2</sup>	20
Hotels:	
Guest rooms	40
Public rooms	100
Corridors serving public rooms	100
Corridors	80
Reviewing stands and bleachers <sup>3</sup>	100
Schools:	
Classrooms	40
Corridors	80
Sidewalks, vehicular driveways, and yards, subject to trucking	250
Skating rinks	100
Stairs and exitways	100
Storage warehouse:	
Light	125
Heavy	250
Stores:	
Retail:	
First floor, rooms	100
Upper floors	75
Wholesale	125
Theaters:	
Aisles, corridors, and lobbies	100
Orchestra floors	60
Balconies	60
Stage floors	150
Yards and terraces, pedestrians	100

**Note 1.** American Association of State Highway Transportation Officials.

**Note 2.** Live load need be applied to joists or to bottom chords of trusses or trussed rafters only in those portions of attic space having a clear height of forty-two (42) inches or more between joist and rafter in conventional rafter construction; and between bottom chord and any other member in trusses or trussed rafter construction. However, joists or the bottom chords of trusses or trussed rafters shall be designed to sustain the imposed dead load or ten pounds per square foot (10 psf) whichever be greater, uniformly distributed over the entire span.

A further ceiling dead load reduction to a minimum of five pounds per square foot (5 psf) or the actual dead load, whichever is greater, may be applied to joists in conventional rafter construction or to the bottom chords of trusses or trussed rafters under either or both of the following conditions:

- If the clear height is not over thirty (30) inches between joist and rafter in conventional construction and between the bottom chord and any other member for trusses or trussed rafter construction.
- If a clear height of greater than thirty (30) inches, as defined in "a" directly above, does not exist for a horizontal distance of more than twelve (12) inches along the member.

**Note 3.** For detailed recommendations, see The Standard for Tents, Grandstands, and Air-Supported Structures Used for Places of Assembly listed in Appendix B.

## SECTION 707.0 CONCENTRATED LOADS

**707.1 General:** Floors of buildings in the locations specified in Table 707 shall be designed to support the uniformly distributed live loads prescribed in Section 706.0 or the following concentrated loads in pounds, whichever produces the greater stresses. Unless otherwise specified, the indicated concentration shall be assumed to occupy an area of two and one-

half (2½) feet square, and shall be so located as to produce the maximum stress conditions in the structural members.

**Table 707**  
**CONCENTRATED LOADS**

Location	Pounds
Elevator machine room grating (on area of 4 sq. in.)	300
Finish light floor plate construction (on area of 1 sq. in.)	200
Garages	See Note 1
Greenhouse roof bars, purlins and rafters	100
Manufacturing and storage buildings	See Note 2
Office floors	2000
Scuttles, skylight ribs and accessible ceilings	200
Sidewalks	8000
Stair treads (on area of 4 sq. in. at center of tread)	300

**Note 1.** Floors in garages or portions of buildings used for storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 706 or the following concentrated loads:

- for passenger cars accommodating not more than nine passengers, 2000 pounds acting on an area of 20 sq. inches;
- mechanical parking structures without slab or deck, passenger cars only, 1500 pounds per wheel; and
- for trucks or buses, maximum axle load on an area of 20 sq. inches.

**Note 2.** For buildings in which mechanical material handling equipment will be utilized, the structural floor slab shall be designed for the actual concentrated loads.

## SECTION 708.0 IMPACT LOADS

**708.1 General:** The live loads specified in Section 706.0 shall be assumed to include adequate allowance for ordinary impact conditions. Provision shall be made in the structural design for special uses and loads which involve vibration and impact forces.

**708.2 Elevators:** All moving elevator loads shall be increased one hundred (100) per cent for impact, and the structural supports shall be designed within the limits of deflection prescribed by the standard safety code for elevators listed in Appendix B.

**708.3 Machinery:** For the purpose of design, the weight of machinery and moving loads shall be increased as follows, to allow for impact:

- elevator machinery .....100%
- light machinery, shaft or motor driven ..... 20%
- reciprocating machinery or power driven units ..... 50%
- hangers for floors or balconies ..... 33%

These percentages shall be increased when so recommended by the manufacturer.

**708.4 Craneways:** All craneways shall have their design loads increased for impact as follows:

- a vertical force equal to twenty-five (25) per cent of the maximum wheel load;
- a lateral force equal to twenty (20) per cent of the weight of the

trolley and lifted load only, applied one-half ( $\frac{1}{2}$ ) at the top of each rail; and

3. a longitudinal force of ten (10) per cent of the maximum wheel loads of the crane applied at top of rail.

**708.5 Assembly structures:** Grandstands, stadiums and similar assembly structures shall be designed to resist a horizontal swaying load applied parallel to the rows of seats, in addition to any wind loads, of not less than twenty-four (24) pounds per lineal foot of seats; and of not less than ten (10) pounds per lineal foot of seats applied transversely.

## SECTION 709.0 SPECIAL LOADS

**709.1 General:** Provisions shall be made for all special loads herein prescribed and all other special loads to which the building or structure may be subjected.

**709.2 Below grade:** All retaining walls and other walls below grade shall be designed to resist lateral soil pressures with due allowance for hydrostatic pressure and for all superimposed vertical loads.

**709.3 Hydrostatic uplift:** All foundation slabs and other footings subjected to water pressure shall be designed to resist a uniformly distributed uplift equal to the full hydrostatic pressure.

**709.4 Railings:** Railings around stairwells, balconies and other floor openings, both exterior and interior, shall be designed to resist a load of at least two hundred (200) pounds applied in any direction at any point of the top rail and also a vertical and a horizontal thrust of fifty (50) pounds per lineal foot applied at the top railing. The concentrated load and distributed loads need not be assumed to act concurrently. Railings and guards of grandstands and similar assembly structures shall be capable of resisting a lateral force of fifty (50) pounds per lineal foot and sustaining a vertical load of one hundred (100) pounds per lineal foot.

**709.5 Construction loads and erection stresses:** Provision shall be made for temporary construction and wind loads which may occur during the erection of the building; and all structural members and connections shall be designed and erected so as to prevent overstressing during construction.

**709.6 Partial loading:** The full intensity of the appropriately reduced live load applied only to a portion of the length of a structure or member shall be considered if it produces a more unfavorable effect than the same intensity applied over the full length of the structure or member.

## SECTION 710.0 ROOF LOADS

**710.1 General:** The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, snow and earthquake loads

in addition to the dead load of construction and the appropriate live loads as prescribed below, or in Table 706 (snow load as provided in Section 711.0; wind load as provided in Section 712.0; and earthquake load as provided in Section 716.0).

**710.2 Minimum roof loads:** Ordinary roofs, either flat, pitched, or curved, shall be designed for the live loads as specified in Table 710 or the snow load, whichever is greater.

**Table 710**  
**MINIMUM ROOF LIVE LOADS\***

Roof slope	Tributary loaded area in square feet for any structural member		
	0 to 200	201 to 600	Over 600
Flat or rise less than 4 inches per foot Arch or dome with rise less than $\frac{1}{8}$ of span	20	16	12
Rise 4 inches per foot to less than 12 inches per foot Arch or dome with rise $\frac{1}{8}$ of span to less than $\frac{3}{8}$ of span	16	14	12
Rise 12 inches per foot and greater Arch or dome with rise $\frac{3}{8}$ of span or greater	12	12	12

\*In pound-force per square foot of horizontal projection.

**710.3 Overhanging eaves:** In other than one- and two-family dwellings, and except where framing of overhang is a continuation of the roof framing, overhanging eaves, cornices and other roof projections shall be designed for a minimum uniformly distributed live load of sixty (60) pounds per square foot (psf).

**710.4 Ponding:** Roofs shall be designed for the maximum possible depth of water that may be ponded thereon as determined by the relative levels of roof deck and overflow weirs, scuppers, edges or serviceable drains in combination with the deflected structural elements.

**710.5 Special purpose roofs:** When used for incidental promenade purposes, roofs shall be designed for a minimum live load of sixty (60) psf; and one hundred (100) psf when designed for roof gardens or assembly uses.

**710.5.1 Landscaped roofs:** Where roofs are to be landscaped, the uniform design live load in the landscaped area shall be twenty (20) psf. The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil.

**710.5.2 Special purpose roofs:** Roofs to be used for other special pur-

poses shall be designed for appropriate loads, or as approved by the building official.

### SECTION 711.0 SNOW LOAD

**711.1 General:** The basic snow loads to be assumed in the design of buildings or other structures are given in Figures 102.1a, 102.1b and L-102.1c in Appendix L-102.0 for the portion of the United States for which isolines of ground snow are shown. These loads correspond to the ground snow load in pound-force per square foot for twenty-five (25-), fifty (50-) and one hundred (100-) year mean recurrence intervals, respectively.

**711.2 Design snow load:** The one hundred (100-) year mean recurrence interval shall be used for all buildings in use groups A, H, I and R-1. The 50-year mean recurrence interval shall be used for all buildings in use groups B, F, M, R-2 and R-3. The twenty-five (25-) year mean recurrence interval shall be used for buildings in use group S and any building in miscellaneous use group T which does not have human occupants. The snow load design used for temporary buildings shall be approved by the building official.

**711.2.1 Special snow regions:** Special consideration shall be given to regions where design loads are not shown in the Figures L-102.1a, L-102.1b and L-102.1c in Appendix L-102.1, and where unusually high accumulations of snow may occur. For areas where records of snow fall or experience indicates that the ground snow loads given in the figures are inadequate, higher basic snow loads shall be used as approved by the building official.

**711.3 Roof snow load:** The minimum snow loads for the design of both ordinary and multiple series roofs, either flat, pitched or curved, shall be determined by multiplying the ground snow load given in the Figures L-102.1a, L-102.1b and L-102.1c in Appendix L-102.1 by the appropriate coefficients,  $C_s$ , given in Section 711.3.1. The effect of roof snow load shall be designed in accordance with Appendix L-102.1 and the more unfavorable effect shall be used for the building design.

**711.3.1 Snow load coefficients:** The basic snow load coefficient,  $C_s$ , shall be taken as eight-tenths, (0.8), and shall be increased or decreased in accordance with the Figures L-102.2a, L-102.2b and L-102.2c in Appendix L-102.1.2. For roofs that have a clear exposure to winds of sufficient intensity to remove snow, and that do not have such projections as parapet walls, a basic snow load coefficient of six-tenths (0.6) may be used. This coefficient may be applied only in those regions where the resulting reduced snow load is equal to, or greater than, twelve (12) psf. Roofs shielded on any side by obstructions within a distance of 10 times  $h$  from the building ( $h$  is the height of the obstruction above the roof level) shall not be considered to have a clear exposure. Snow load distributions and coefficients for typical roof configurations are given in Appendix L-102.1.2.

Where more than one (1) case is specified, each case shall be considered separately in designing structural elements.

## SECTION 712.0 WIND LOAD

**712.1 Design:** All exposed structures or parts of structures shall be designed to resist the pressures due to wind in any direction, as provided in Sections 712.0 to 715.0 inclusive. The basic minimum wind speeds are shown in Figure 712.1 for the geographic location of the structure. The minimum wind pressures corresponding to specific wind speeds and heights are shown in Table 712.1. In all cases, the wind loads shall be considered as acting normal to the surfaces to which they apply. These provisions do not apply to structures of unusual shape, exposure, or structural characteristics which would make them susceptible to unusual stresses. In such cases, special engineering investigations are required.

Table 712.1  
EFFECTIVE VELOCITY PRESSURES\*  
FOR ORDINARY BUILDINGS AND STRUCTURES

Height (ft)	Basic wind speed (mph)								
	50	60	70	80	90	100	110	120	130
Less than 30	10	10	10	10	13	16	20	23	27
30-40	10	10	11	14	17	21	27	31	36
40-75	10	10	12	15	19	24	29	34	40
75-125	10	11	15	19	24	30	36	43	51
125-175	10	12	17	22	28	34	41	49	58
175-225	10	14	18	24	31	38	46	54	64
225-275	10	15	20	26	33	41	49	59	69
275-325	11	16	21	28	35	43	52	62	73
325-375	11	16	22	29	37	45	55	65	77
375-425	12	17	23	31	39	48	58	69	81
425-475	12	18	24	32	40	50	60	72	84
475-525	13	18	25	33	42	51	62	74	87
525-575	13	19	26	34	43	53	64	76	90
575-625	14	20	27	35	44	55	66	79	92
625-675	14	20	28	36	46	57	69	82	96
675-725	14	21	28	37	47	58	70	83	98
725-775	15	21	29	38	48	59	72	86	100
775-825	15	22	30	39	49	61	73	87	102

\*Pressures, in pounds per square foot, are based on geographic locations such as suburban areas, towns, city outskirts, wooded areas and rolling terrain.

### 712.2 Special wind conditions

**712.2.1 Increased loads:** For structures located in flat, open country, open flat coastal belts, grassland, unusually exposed positions or in geographical regions where local records indicate higher wind loads than established in Section 712.1 the higher wind load shall be used.

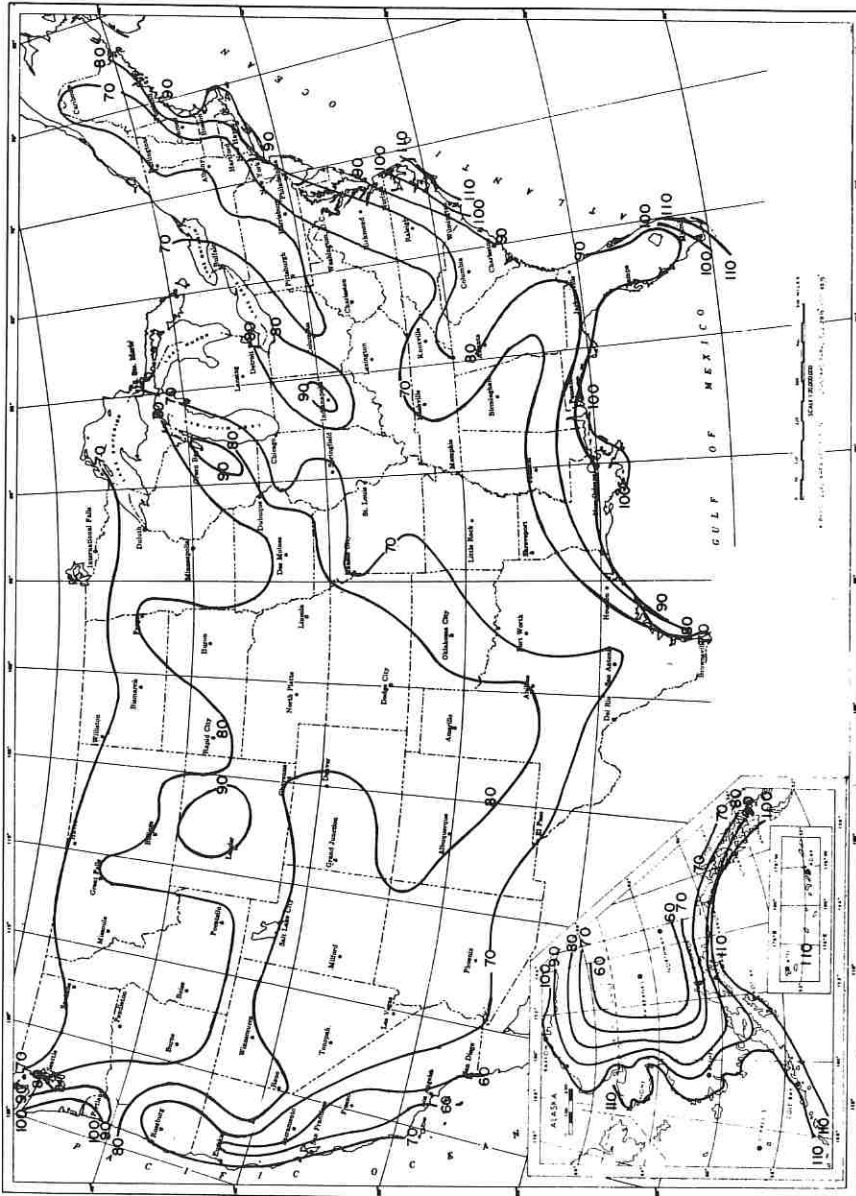
# STRUCTURAL AND FOUNDATION LOADS AND STRESSES

**Figure 712.1**

Basic Wind Speed in Miles per Hour

Annual Extreme Fastest-Mile Speed 30 Feet Above Ground, 50-Year Mean Recurrence Interval\*

\*This figure applies to all types of storms except tornadoes



**712.2.2 Decreased loads:** For structures located in centers of large cities, very rough, hilly terrain and in geographical regions where substantiating data indicates lower wind loads than established in Section 712.1, designs based on lower wind loads may be approved.

**Exception:** Reductions in wind loads due to direct shielding afforded by adjacent structures shall not be permitted.

**712.3 Torsional resistance:** The structural frame of all structures subjected to wind or other lateral loads shall be designed to resist the torsional moment due to eccentricity of the resultant load with respect to the center of rigidity of the structure.

**712.4 Anchorage:** Anchorage of the roof to walls and columns and of walls and columns to the foundation system to resist overturning, uplift, and sliding forces shall be provided.

**712.5 Overturning:** The overturning moment due to the wind load on all structures shall not exceed two-thirds ( $2/3$ ) of the stabilizing moment resulting from the dead load of the structure, unless the structure is anchored to resist the excess overturning moment and the excess horizontal shear over sliding friction.

### SECTION 713.0 WIND ON VERTICAL SURFACES

**713.1 General:** The wind pressures on vertical surfaces to be considered in the design of the elements of the structure shall be those prescribed in Section 712.1 distributed and modified in accordance with this section. The wind pressure shall be applied to the gross area of the vertical surface of that portion of the structure above grade.

**713.2 Bracing system:** Forces due to wind loads shall be transferred to the ground by a properly designed structural system.

**713.3 Primary framing members:** Structural members and systems providing stability for the structure shall be designed and constructed for the basic wind pressures indicated in Table 712.1 and modified in Sections 713.3.1 and 713.3.2. Pressures shall be multiplied by the coefficients indicated in Table 713.3.1 and in Section 713.3.2.

**713.3.1 External distribution:** The wind pressure shall be distributed between exterior walls as a normal inward pressure on the windward wall and as a normal outward pressure on the leeward and sidewalls in accordance with Table 713.3.1.

Table 713.3.1  
EXTERNAL DISTRIBUTION COEFFICIENTS FOR VERTICAL SURFACES  
PRIMARY FRAMES AND SYSTEMS

Windward wall	0.8
Leeward wall	0.5
If height width and height length ratios are greater than 2.5	0.6
Side walls	0.7



**713.3.2 Internal pressures:** An internal pressure equal to 1.0 times the basic wind pressure shall be applied to all primary members acting outward. This pressure is not to be combined with the pressures determined in Section 713.3.1.

**713.4 Secondary components:** Girts, windows and glazing, doors and door frames, spandrels and similar secondary components and their connections shall be designed and constructed to transfer the wind pressures to the primary framing members.

**713.4.1 Distribution:** Secondary components shall be designed to resist internal and external wind pressures equal to one and fifty-hundredths (1.50) of those determined by Section 712.1 but in no case less than fifteen (15) psf.

#### SECTION 714.0 WIND ON INCLINED SURFACES

**714.1 General:** The wind pressures on inclined surfaces including roofs to be considered in the design of the elements of the structure shall be those prescribed in Section 712.1 distributed and modified in accordance with this section.

**714.2 Primary framing members:** Structural members and systems providing stability for the structure shall be designed and constructed for the basic wind pressures indicated in Table 712.1 as modified and distributed in accordance with Section 714.2.1.

**714.2.1 External distribution:** The external wind pressures on inclined surfaces shall be distributed as indicated in Table 714.2.1 and shall be based on the average height of the lower edge or roof eave above grade, the slope of the surface at the location under consideration and the ratio of sidewall height to building width.

Table 714.2.1  
EXTERNAL DISTRIBUTION FACTORS<sup>a</sup> FOR INCLINED SURFACES  
PRIMARY FRAMES AND SYSTEMS

Ratio of sidewall height to building width	Windward slope angle with horizontal						All leeward slopes
	Flat to 15°	15° to 25°	25° to 35°	35° to 45°	45° to 60°	More than 60°	
0.3 or less	-1.0	0.2	0.3	0.4	0.5	0.8	-0.7
0.5	-1.0	-0.8	-0.2	0.3	0.5	0.8	-0.7
1.0	-1.0	-1.0	-0.6	-0.1	0.5	0.8	-0.7
1.5	-1.0	-1.0	-0.9	-0.4	0.2	0.8	-0.7
2.5 or more	-1.0	-1.0	-1.0	-0.2	0.1	0.8	-0.8

Note a: — indicates forces outward; all others indicate forces inward.

**714.2.2 Arched surfaces:** The external wind pressures assumed to be acting on the primary framing members of external arched surfaces shall

not be less than those indicated in Table 712.1 as distributed in accordance with Table 714.2.2.

Table 714.2.2

**EXTERNAL DISTRIBUTION FACTOR<sup>a</sup> FOR ARCHED SURFACES ON ELEVATED SUPPORTS  
PRIMARY FRAMES AND SYSTEMS**

Rise to span ratio	Windward quarter	Center half	Leeward quarter
less than 0.2	—0.9	—0.8	—0.5
0.2 to 0.25	—0.6	—0.9	—0.5
0.25 to 0.3	—0.5	—1.0	—0.5
0.3 to 0.35	0.2	—1.0	—0.5
0.35 to 0.4	0.4	—1.1	—0.5
0.4 to 0.5	0.6	—1.2	—0.5
more than 0.5	0.9	—1.3	—0.5

**Note a:** — indicates forces outward; all others indicate forces inward.

**714.3 Secondary members:** Secondary roof framing, purlins, roof panels, glazing and sheathing and their connections shall be designed to resist wind pressures as specified in Section 713.4.1.

**714.4 Overhang uplift:** Overhanging eaves, cornices and other roof projections shall be designed and constructed to withstand an upward pressure of two (2) times the wind pressures given in Table 712.1.

## **SECTION 715.0 WIND LOADS ON SIGNS, TANK AND RADIO TOWERS AND CHIMNEYS**

**715.1 Ground signs and towers:** The wind pressure on ground signs and towers other than radio and television towers, shall be those prescribed in Section 713.4 for secondary components.

**715.2 Roof structures:** The wind pressure on roof signs, tank towers, stacks, chimneys and other exposed roof structures with plane surfaces shall be those prescribed in Section 713.4 for secondary components except as provided in Sections 715.3 and 715.4.

**715.3 Shielding effect:** The shielding effect of one element by another shall not be considered when the distance between them exceeds four (4) times the projected smallest dimension of the windward element.

**715.4 Effect of shape:** Net pressure coefficients for chimneys, tanks and similar structures are prescribed in Table 715.4. These coefficients apply to the projected area of the structure on a vertical plane normal to the wind direction. For slender structures such as flagpoles, a minimum net pressure coefficient of 1.2 shall be used if  $d \sqrt{q} < 2.5$ .

**Table 715.4**  
**NET PRESSURE COEFFICIENTS FOR CHIMNEYS AND TANKS**

Shape	Type of surface	h/d		
		1	7	25
Square (wind normal to a face)	Smooth or rough	1.3	1.4	2.0
Square (wind along diagonal)	Smooth or rough	1.0	1.1	1.5
Hexagonal or octagonal ( $d'/q > 2.5$ )	Smooth or rough	1.0	1.2	1.4
Round ( $d'/q > 2.5$ )	Moderately smooth*	0.5	0.6	0.7
	Rough ( $d'/d \leq 0.02$ )	0.7	0.8	0.9
	Very rough			
	( $d'/d \leq 0.08$ )	0.8	1.0	1.2

\*Metal, timber, concrete.

**Note:** h = height of structure in feet; d = diameter or least horizontal dimension in feet; d' = depth in feet of protruding elements such as ribs and spoilers; q = the effective velocity pressure in psf from Table 712.1.

## SECTION 716.0 EARTHQUAKE LOAD

**716.1 General:** In regions where local experience or the records of the National Ocean Survey show loss of life or damage of buildings resulting from earthquakes, buildings and structures hereafter erected shall be designed to withstand lateral forces as provided in Appendix L-101.0 of this code, except as exempted in Section 716.2.

**716.2 Exemptions:** Earthquake loading shall not be required in calculating the structural frame of a building or structure when the building complies with one (1) or more of the following conditions:

1. is located in zone 0 of Figure L-101.1 in Appendix L-101.0;
2. is located where local experience or the records of the National Ocean Survey do not show loss of life or damage to property, regardless of zone;
3. is a one- or two-family dwelling; or
4. is a minor accessory building.

## SECTION 717.0 COMBINATION OF LOADS

**717.1 General:** Loads listed herein shall be considered to act in the following combinations, whichever produce the most unfavorable effects in the building, foundation, or structural member concerned, reduced when appropriate, according to Section 718.0. The most unfavorable effect may occur when one (1) or more of the contributing loads are not acting:

1. dead load,
2. dead load plus live load,
3. dead load plus (wind load or earthquake load),
4. dead load plus thermal load,

5. dead load plus live load plus (wind load or earthquake load),
6. dead load plus live load plus thermal load,
7. dead load plus (wind load or earthquake load) plus thermal load, and
8. dead load plus live load plus (wind load or earthquake load) plus thermal load.

Thermal load is the loads, forces, and effects due to contraction or expansion resulting from temperature changes, shrinkage, moisture changes, creep in component materials, movement due to differential settlement or combinations thereof.

**717.2 Probability factor:** The total of the combined load effects may be multiplied by the following load combination probability factors. An increase in the allowable stresses will not be allowed in conjunction with a decrease due to the above load combinations.

1. 1.00 for combinations 1 through 4 listed in Section 717.1 above.
2. 0.75 for combinations 5 through 7 listed in Section 717.1 above.
3. 0.66 for combination 8 listed in Section 717.1 above.

**717.3 Dead load counteracting live load:** When loads other than dead loads counteract dead loads in a structural member or joint, special care shall be exercised by the designer to ensure adequate safety for possible stress reversals.

**717.4 Wind neglected:** When the stress due to wind is less than one-third ( $\frac{1}{3}$ ) of the stress due to dead load plus live load, the wind stress may be neglected.

## SECTION 718.0 LIVE LOAD REDUCTION

**718.1 General:** In all buildings and structures the design live loads may be reduced on columns, piers, walls, trusses, girders, slab systems designed for flexure in more than one (1) direction, and on foundations as herein specified.

**718.2 Live loads 100 pounds or less:** For live loads of one hundred (100) pounds or less per square foot, the design live load on any member supporting one hundred fifty (150) square feet or more may be reduced at the rate of eight-hundredths per cent (0.08%) per square foot of area supported by the members, except that a reduction shall not be made for garages, open parking structures, roofs or for areas to be occupied as places of public assembly. The reduction shall exceed neither "R" as determined by the following formula, nor sixty (60) per cent:

$$R = 23 \left( 1 + \frac{D}{L} \right)$$

where

R = reduction in per cent;

D = dead load per square foot of an area supported by the member; and

$L$  = design live load per square foot of area supported by the member.

**718.3 Live loads more than 100 pounds:** For live loads exceeding one hundred (100) psf, a reduction shall not be made, except that the design live loads on columns may be reduced twenty (20) per cent.

### SECTION 719.0 ALLOWABLE WORKING STRESSES

**719.1 Controlled materials:** The design and working stresses of all controlled materials as defined in Section 201.0, or of any structural material that is identified as to manufacture and grade by mill tests or the strength and stress grade is otherwise confirmed to the satisfaction of the building official, shall conform to the specifications and methods of design of accepted engineering practice or to the approved rules in the absence of applicable standards. A building or structure may be erected in whole or in part of controlled materials or ordinary materials. See Section 719.2.

**719.2 Ordinary material:** The use of ordinary materials without selection and without controlled design and supervision, or when the material is not identified as to strength and stress grade, shall be limited to the average unit working stresses prescribed in Appendix K.

**719.3 New materials:** For materials which are not specifically provided for in this code, the working stresses shall be established by tests as provided in Sections 702.0 and 802.0.

### SECTION 720.0 BEARING VALUE OF SOILS

**720.1 Soil analysis:** All applications for permits for the construction of new buildings or structures, and for the alteration of a permanent structure which require changes in foundation loads and distribution, shall be accompanied by a statement describing the soil in the ultimate bearing strata, including sufficient records and data to establish its character, nature and load-bearing capacity. Such records shall be certified by a licensed professional engineer or a licensed architect.

**720.2 Satisfactory foundation materials:** Satisfactory bearing materials for spread footings shall include ledge rock on its natural bed; natural deposits of sand, gravel or firm clay, or a combination of such materials, provided they do not overlie an appreciable amount of peat, organic silt, soft clay, or other objectionable materials.

**720.3 Presumptive bearing values:** Except when determined by field loading tests or as otherwise provided herein, the maximum allowable pressure on supporting soils under spread footings at or near the surface shall not exceed the values specified in Table 720. Presumptive bearing values shall apply to all materials of similar physical characteristics and disposition. Surface values shall be adjusted for deep footings, and for the

bearing strata under piles as provided in this code. When foundation piles are driven to penetrate into sound rock, the allowable bearing values in Table 720 may be increased as prescribed in Section 739.0.

**Table 720**  
**PRESUMPTIVE SURFACE BEARING VALUES OF FOUNDATION MATERIALS**

Class of material	Tons per square foot
1. Massive crystalline bed rock including granite, diorite, gneiss, trap rock, hard limestone and dolomite .....	100
2. Foliated rock including bedded limestone, schist and slate in sound condition .....	40
3. Sedimentary rock including hard shales, sandstones, and thoroughly cemented conglomerates .....	25
4. Soft or broken bed rock (excluding shale), and soft limestone .....	10
5. Compacted, partially cemented gravels, and sand and hardpan overlying rock .....	10
6. Gravel and sand-gravel mixtures .....	6
7. Loose gravel, hard dry clay, compact coarse sand, and soft shales .....	4
8. Loose, coarse sand and sand-gravel mixtures and compact fine sand (confined) .....	3
9. Loose medium sand (confined), stiff clay .....	2
10. Soft broken shale, soft clay .....	1.5

**720.4 Light weight structures:** Mud, organic silt, or unprepared fill shall be assumed not to have presumptive bearing capacity unless approved by test, except where the bearing capacity is deemed adequate by the building official for the support of light weight and temporary structures.

## **SECTION 721.0 FOUNDATION INVESTIGATIONS**

**721.1 When required:** In the absence of satisfactory data from immediately adjacent areas, the owner or applicant shall make borings, test pits, or other soil investigations at such locations and to sufficient depths of the bearing materials to the satisfaction of the building official. For all buildings which are more than three (3) stories or forty (40) feet in height, and whenever it is proposed to use float, mat or any type of deep foundation, there shall be at least one (1) exploratory boring to rock or to an adequate depth below the load-bearing strata for every twenty-five hundred (2500) square feet of built-over area, and such additional tests that the building official may direct. When the safe sustaining power of the soil is in doubt, or superior bearing value than specified in this code is claimed, the building official shall direct that the necessary borings or tests be made.

**721.2 Soil samples:** Samples of the strata penetrated in test borings or test pits, representing the natural disposition and conditions at the site, shall be available for examination by the building official. Wash or bucket samples shall not be accepted.

**721.3 Varying soil values:** When test borings indicate non-uniformity of

bearing materials, a sufficient number of additional borings shall be made to establish strata levels of equal bearing capacity.

**721.4 Cost of tests:** Costs of soil investigations shall be at the expense of the owner.

## SECTION 722.0 SOIL TEST PROCEDURE

**722.1 Soil test method:** The test procedure and testing apparatus shall be approved by the building official before they are used; and a complete record of the tests, together with a record of the soil profile, shall be filed by the licensed engineer or architect who shall have a fully qualified representative on the site during all boring and test operations.

**722.2 Loaded area:** For spread footings, the soil shall be loaded at one (1) or more places and at the required level or levels. The loaded area shall be approximately four (4) square feet for all bearing materials; except that when the footing overlies wet clay or other soft materials, the test load shall be applied to an area of not less than ten (10) square feet.

**722.3 Recorded settlements:** Loads shall be applied in continuous increments of not more than one-quarter ( $\frac{1}{4}$ ) of the proposed safe load. When the proposed load has been reached, it shall remain undisturbed and readings shall be recorded to determine the rate of settlement until the settlement in eight (8) consecutive hours is less than one-hundredth (0.01) inches. A fifty (50) per cent excess load shall then be applied and allowed to remain in place until the rate of settlement is less than one-hundredth (0.01) inches in twenty-four (24) hours.

**722.4 Accuracy of loading:** Test loads applied by mechanical devices shall be automatically controlled so as to insure not more than five (5) per cent variation in applied load. Such devices shall be calibrated prior to the test.

**722.5 Test acceptance:** The load settlement shall be represented diagrammatically, and a test shall not be deemed satisfactory if the net settlement after removal of the test load exceeds one-hundredth (0.01) inches per ton of gross load applied.

## SECTION 723.0 ALLOWABLE FOUNDATION LOADS

**723.1 General:** The maximum allowable loads under all types of foundations shall be limited by accepted engineering practice and as provided herein.

**723.2 Rock foundations:** Where subsurface explorations at the project site indicate variations or doubtful characteristics in the structure of the rock upon which it is proposed to construct foundations, a sufficient number of borings shall be made to a depth of not less than ten (10) feet

below the level of the footings to provide assurance of the soundness of the foundation bed and its bearing capacity.

**723.3 Increased rock capacity:** The presumptive bearing capacity of Class 1 or Class 2 rock may be increased when the surface is leveled or benched; provided such increased safe capacity is determined by load tests on an area of not less than one (1) square foot in accordance with the provisions of Section 722.0; but such loads shall not be increased to exceed the unit compressive stress permitted on reinforced concrete footings under the provisions of this code.

#### SECTION 724.0 DEPTH OF FOOTINGS

**724.1 Frost protection:** Except when erected upon solid rock or otherwise protected from frost, foundation walls, piers and other permanent supports of all buildings and structures larger than one hundred (100) square feet in area or ten (10) feet in height shall extend below the frost line of the locality, and spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing value of the soil. Or, such structures shall be supported on piles or ranging timbers when solid earth to rock is not available. Footings shall not be founded on frozen soils unless such frozen condition is of a permanent character.

**724.2 Isolated footings:** Footings on granular soil of Classes 5 to 10 inclusive in Table 720 shall be so located that the line drawn between the lower edges of adjoining footings shall not have a steeper slope than thirty (30) degrees with the vertical, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner.

**724.3 Floating mat:** Floating mat foundations shall be located on permanently undisturbed soil of adequate bearing capacity. The building official may approve a continuous foundation mat which is located directly on the ground when adequate sub-soil drainage and a rat-proof apron as specified in Section 873.0 are provided when required. Where subject to freezing, the footings shall be designed to resist frost action. The requirements of Section 507.0 governing the ventilation of crawl spaces under grade construction shall be waived provided adequate provision is made for dampproofing and waterproofing when required.

#### SECTION 725.0 FOOTING DESIGN

**725.1 Design loads:** The full dead load including the weight of foundations, footings, and overlying fill and the reduced live loads as specified in Section 718.0, shall be used in designing footings.

**725.2 Pressure due to lateral loads:** If the increased pressure on any footing due to wind, earthquake or other lateral loads does not exceed one-



third ( $\frac{1}{3}$ ) of the dead and live load pressures alone, such loads may be neglected. When such increased pressure is more than one-third ( $\frac{1}{3}$ ), the lateral loads shall be considered in the design with a one-third ( $\frac{1}{3}$ ) increase in allowable soil pressure under the combined load.

**725.3 Earthquake loads:** In localities subject to seismic disturbances, special provision shall be made in the foundation design to comply with the provisions of Section 716.0.

**725.4 Vibratory loads:** Where machinery or other vibrations may be transmitted through the foundations, consideration shall be given in the design of the footings to prevent detrimental disturbances of the soil.

**725.5 Varying unit pressures:** Footings shall be so designed that the unit soil pressure under the dead load shall be as uniform as possible under all parts of the building or structure. When necessary for stability in the structure due to settlement or varying soil conditions, variations may be permitted in the unit pressure under different footings in accordance with accepted engineering practice.

## SECTION 726.0 TIMBER FOOTINGS, WOOD FOUNDATIONS

**726.1 Timber footings:** Timber footings may be used for wood frame structures and as otherwise approved by the building official. Such footings shall be treated in accordance with the applicable standards in Appendix C or shall be placed entirely below permanent water level, except that untreated timbers may be used as capping of wood piles which project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon piles shall not exceed seventy (70) per cent of the allowable stresses for the species and grade of timber as specified in the National Design Specification for Wood Construction listed in Appendix B.

**726.2 Pole buildings:** Pole type buildings shall be designed and erected in accordance with the applicable standards listed in Appendix B. The poles shall be treated in accordance with the applicable standards in Appendix C.

**726.3 Wood foundations:** Wood foundation systems shall be designed and installed in accordance with the standards listed in Appendix B. All lumber and plywood shall be treated in accordance with the applicable standards listed in Appendix C and shall be identified as to conformance with such standards by an approved inspection agency.

## SECTION 727.0 STEEL GRILLAGES

**727.1 General:** All steel grillage beams shall be separated with approved steel spacers and shall be entirely encased in at least three (3) inches of concrete and the spaces between beams shall be completely filled

with concrete or cement grout. When used on yielding soils, steel grillages shall rest on approved concrete beds not less than six (6) inches thick.

## SECTION 728.0 CONCRETE FOOTINGS

**728.1 Concrete strength:** Concrete in footings shall have an ultimate compressive strength of not less than twenty-five hundred (2500) pounds per square inch (psi) at twenty-eight (28) days.

**728.2 Design:** Concrete footings shall comply with Sections 840.0 through 843.0 and the Building Code Requirements for Reinforced Concrete listed in Appendix B.

### 728.3 Thickness

**728.3.1 Plain concrete:** In plain concrete footings, the edge thickness shall be not less than eight (8) inches for footings on soil; except that for one- and two-family dwellings and buildings less than two (2) stories in height of Type 4 construction, the edge thickness may be reduced to six (6) inches, provided the footing does not extend beyond four (4) inches on either side of the supported wall.

**728.3.2 Reinforced concrete:** In reinforced concrete footings the thickness at the edge above the bottom reinforcement shall be not less than six (6) inches for footings on soil, nor less than twelve (12) inches for footings on piles. The clear cover on reinforcement where the concrete is cast against the earth shall not be less than three (3) inches. Where concrete is exposed to soil after it has been cast, the clear cover shall be not less than one and one-half (1½) inches for reinforcement smaller than No. 5 bars or five-eighths (⅝) inch diameter wire, nor two (2) inches for larger reinforcement.

**728.4 Footings on piles and pile caps:** Footings on piles and pile caps shall be of reinforced concrete. The soil immediately below the pile cap shall not be considered as carrying any vertical load. The top of all piles shall be embedded not less than three (3) inches into pile caps and the caps shall extend at least three (3) inches beyond the edge of all piles.

**728.5 Deposition:** Concrete footings shall not be poured through water unless otherwise approved by the building official. When poured under, or in the presence of, water, the concrete shall be deposited by approved means which insure minimum segregation of the mix and negligible turbulence of the water.

**728.6 Protection of concrete:** Concrete footings shall be protected from freezing during deposition and for a period of not less than five (5) days thereafter and water shall not be allowed to flow through the deposited concrete.

**SECTION 729.0 MASONRY UNIT FOOTINGS**

**729.1 Dimensions:** Masonry unit footings shall be laid in type M or S mortar complying with Section 815.0 and the depth shall be not less than twice the projection beyond the wall, pier or column; and the width shall be not less than eight (8) inches wider than the wall supported thereon.

**729.2 Offsets:** The maximum offset of each course in brick foundation walls stepped up from the footings shall be one and one-half (1½) inches if laid in single courses, and three (3) inches if laid in double courses.

**SECTION 730.0 MAT, RAFT AND FLOAT FOUNDATIONS**

**730.1 General:** Mat, raft and float foundations shall be used only when the applied loads of the building or structure are so arranged as to result in practically uniformly balanced loading, and the soil immediately below the mat is of uniform bearing capacity. The characteristics of the soil under the mat or raft shall be considered in the analysis of loading on mats and other continuous footings and due allowance shall be made for possible concentrated soil pressures under heavily loaded columns.

**SECTION 731.0 PIER FOUNDATIONS****731.1 Dimensions**

**731.1.1 Lateral dimensions and height:** Except for one- and two-family dwellings and other light structures, the minimum dimension of isolated piers used as foundations shall be two (2) feet, and the height shall not exceed twelve (12) times the least horizontal dimension, unless constructed of reinforced concrete or structural steel, or when entirely encased in a steel shell at least one-quarter ( $\frac{1}{4}$ ) inch thick. Greater heights may be approved by the building official when surrounding foundation materials furnish adequate lateral support.

**731.1.2 Belled bottoms:** When pier foundations are belled at the bottom, the edge thickness of the bell shall be not less than that required for the edge of footings. If the sides of the bell slope at an angle less than sixty (60) degrees from the horizontal, the effects of vertical shear shall be considered.

**731.2 Design**

**731.2.1 Plain concrete:** When the unsupported height of foundation piers exceeds six (6) times the least dimension, the allowable working stress on piers of unit masonry or plain concrete shall be reduced in accordance with accepted engineering practice.

**731.2.2 Reinforced concrete:** When constructed of reinforced concrete, foundation piers may be reinforced with spiral or vertical reinforcement in accordance with the applicable standards for the design of columns listed

in Appendix B; except that when adequate lateral support is furnished by the surrounding materials as defined in Section 734.0, the requirements for long columns shall be waived.

**731.2.3 Steel shell:** When concrete piers are entirely encased with a circular steel shell, the area of the shell steel may be considered as reinforcing steel, provided the steel is protected under the conditions specified in Section 733.0. All horizontal joints in the shell shall be spliced to comply with Section 732.0.

**731.3 Dewatering:** When piers are carried to depths below water level, the piers shall be constructed by a method which will insure accurate preparation and inspection of the bottom and the deposition or construction of sound concrete or other masonry in the dry.

## SECTION 732.0 PILE FOUNDATIONS

**732.1 Design:** Pile foundations shall be designed to transmit building loads to lower strata of foundation materials when the supporting materials immediately underlying the structure are of inadequate load capacity or for the purpose of altering the physical properties of the surrounding strata. The bearing value of the supporting soil shall be evaluated as prescribed in Section 734.0. Piles may be constructed of any approved structural materials within the limitations of design and allowable working stresses of this code.

**732.2 Site investigation:** The building site shall be investigated for all conditions which might promote deterioration of pile foundations, and approved protective measures shall be taken to prevent corrosion or other destructive action from deleterious conditions. When the boring records or site conditions indicate destructive action because of soil conditions or changing water level, the pile shall be protected by approved preservative treatments or impervious encasements as provided in Section 733.0.

**732.3 Spacing:** The minimum center-to-center spacing of piles shall be not less than twice the average diameter of a round pile, nor less than one and three-quarter ( $1\frac{3}{4}$ ) times the diagonal dimension of a rectangular pile. When driven to or penetrating into rock, the spacing shall be not less than twenty-four (24) inches. When receiving principal support from end-bearing on materials other than rock or through frictional resistance, the spacing shall be not less than thirty (30) inches.

**732.4 Wall piles:** All piles in wall foundations shall be staggered about the center line of the wall at a minimum distance of one-half ( $\frac{1}{2}$ ) the top diameter therefrom; except that under wood frames, light gage steel and other light weight construction not over thirty-five (35) feet in height, piles may be driven in a single row.

**732.5 Isolated pier piles:** When supported on piles, not less than three

(3) piles shall be furnished under columns, piers or other isolated loads, unless lateral bracing is provided to insure stability.

**732.6 Minimum dimensions:** Tapered piles shall have a minimum butt diameter of eight (8) inches and a diameter of not less than six (6) inches at any other section; except as provided for timber piles in Section 735.0. Piles of uniform circular section shall have a minimum outside diameter of eight (8) inches, and if of other than circular section, a minimum diameter of seven and one-half ( $7\frac{1}{2}$ ) inches. Tapered shoes or points of lesser dimensions than herein prescribed may be attached to the pile unit.

**732.7 Minimum length and penetration:** Piles located within twenty-five (25) feet of lot lines shall be driven so that the point shall be not less than ten (10) feet below the nearest established curb level; and a pile shall not be less than ten (10) feet in length below the cut-off level unless otherwise approved by the building official.

**732.8 Splices:** Splices shall be avoided insofar as practicable. Where used, splices shall be such that the resultant vertical and lateral loads at the splices are adequately transmitted. Splices shall be so constructed as to provide and maintain true alignment and position of the component parts of the pile during installation and subsequent thereto. The ends of each section of steel pipe or other steel elements shall be cut perpendicular to the axis and bearing surfaces shall be true-fitted with milled or ground faces or by flame cutting or other approved method. Proper consideration shall be given to the design of splices at sections of piles which may be subject to tension or to bending. Except for piles which can be visually inspected after driving, splices shall develop not less than fifty (50) per cent of the value of the pile in bending.

**732.9 Jetting:** Piles may be jetted through foundation material listed as Classes 6 to 9 inclusive in Table 720, and only when approved by the building official in other classes of materials. The approval to permit jetting of piles shall be issued by the building official in writing. Immediately after completion of jetting the piles shall be driven to the required load resistance as determined by the application of an approved pile driving formula.

**732.10 Precautions:** During driving, all piles shall be held in their design location and position. If any pile is out of alignment more than two (2) per cent of the pile length, or is driven more than three (3) inches laterally from design location, the design shall be modified to provide for resultant eccentricity. When necessitated by the severity of driving, both the butt and the point of the pile shall be protected from injury to the satisfaction of the building official. A competent and qualified inspector satisfactory to the building official shall be on the work at all times while pile foundations are being cast, driven or fabricated and while test piles are being loaded. The inspector shall make and submit to the building official complete records of all installations and tests.

**732.11 Installation:** Piles shall be driven in such manner and sequence as to prevent distortion or injury of piles already in place.

### **SECTION 733.0 CORROSION PROTECTION**

**733.1 Preservative treatments:** The preservative treatment of timber piles shall comply with the provisions of Section 735.0 and the applicable standards in Appendix C.

**733.2 Protection:** When the soil or the surrounding medium in contact with an all-metal, metal encased, concrete or timber caisson or pile, contains destructive chemical elements, the pile, caisson, or pier shall be provided with a suitable method of protection which may include protective coatings, electrolytic methods, protective jackets or other approved protective methods. When the protective jacket is of concrete, the thickness of cover over the steel shall be not less than one and one-half ( $1\frac{1}{2}$ ) inches.

**733.3 Cinder fill:** The presence of cinder fill or waste from any kind of chemical operation shall be considered sufficient reason for protective jacketing unless chemical study and analysis of the soil indicates it to be inactive.

### **SECTION 734.0 ALLOWABLE PILE LOADS**

**734.1 General:** The allowable load on piles shall be determined by the applicable formulas complying with accepted engineering practice. The maximum load capacity shall be limited by the supporting capacity of the soil as determined by driving resistance or by load test as herein prescribed; but the load shall not exceed the capacity of the pile designed as a short or long column in accordance with accepted engineering practice and the provisions of this code.

**734.2 Lateral support:** Any soil other than water or fluid soil shall be deemed to afford sufficient lateral support to permit the design of any type of pile as a short column. When piles are driven through soil which will be removed subsequent to the completion of the foundation, the resistance offered by such material shall not be considered to contribute to the lateral supporting capacity.

**734.2.1 Fixed ends:** When not assumed laterally supported by the surrounding soils and when fixed by lateral supports at the upper end only, the unsupported length of pile or other isolated foundation shall be assumed as three-quarters ( $\frac{3}{4}$ ) the total length; and when supported at the bottom by drilling or other rigid attachment into the bedrock in addition to the top lateral support, the unsupported length shall be assumed as one-half ( $\frac{1}{2}$ ) the total length.

**734.3 Short column load:** Except when extending above permanent ground level or when driven in surrounding material which furnishes

negligible lateral support as defined in Section 734.2, or when driven through soil which will be removed subsequent to the completion of the pile, all piles used to support a building or structure or part thereof shall be designed as short columns under the provisions of this code for the structural materials involved. The average compressive stress on any cross-section of a pile produced by that portion of the design load which is transmitted to that section shall not exceed the allowable column values of this code.

**734.4 Driving formula load:** The allowable load on any pile when determined by the application of an approved driving formula shall not exceed forty (40) tons. The formula load shall be determined for gravity-drop or power-actuated hammers and the hammer energy used shall be the maximum consistent with the size, strength and weight of the driven piles. The use of a follower shall be permitted only with the approval of the building official.

**734.5 Approved test load:** When greater loads per pile than permitted by Section 734.4 are desired, control-test piles shall be tested in each area by maintaining constant load under increasing settlements in accordance with the procedure prescribed for soil tests in Section 722.0. The resulting allowable load shall be not more than one-half ( $\frac{1}{2}$ ) of that test load which produces a permanent net settlement per ton of test load of not more than one-hundredth (0.01) inch. In subsequent driving of the balance of foundation piles, all piles shall be deemed to have a supporting capacity equal to the control-pile, when the rate of penetration of such piles is equal to or less than that of the control-pile through a comparable driving distance; except as provided in Section 734.6. Not less than three (3) test piles shall be driven in any area of uniform foundation materials and one (1) of such test piles shall be test loaded. At least one (1) test shall be made for each fifteen thousand (15,000) square feet of building area.

#### **734.6 Group pile load**

**734.6.1 Limiting load:** The total allowable load on any cluster or group of piles shall not exceed the bearing capacity on the gross loaded area of the underlying soil stratum, assuming a uniform load spread within an angle of sixty (60) degrees with the horizontal from the area occupied by the pile group plus a margin of one (1) foot surrounding the periphery of the cluster. There shall not be overlap of pressure areas from similar distribution of loads for adjacent pile groups.

**734.6.2 Load test of pile groups:** In determining the load capacity by load tests of any group, when driven through materials subject to displacement or shift, the immediately surrounding pile groups shall be driven in place before the test load is applied to that group.

**734.7 Limiting pile loads:** The capacities of any single pile shall not



exceed the following values when the maximum pile load is determined in accordance with Section 734.5.

Approved test load:

1. two hundred (200) tons when open-ended concrete-filled steel pipe piles are installed to bear on rock;
2. one hundred and fifty (150) tons on all other types of piles when bearing on rock except timber piles (see Section 735.5);
3. one hundred (100) tons when bearing on or in materials of Classes 3, 4, and 5 in Table 720; and
4. sixty (60) tons when bearing on or in other materials classified in Table 720.

**734.7.1 Substantiation of higher allowable loads on piles:** Individual pile loads higher than those indicated in Section 734.7 may be approved by the building official when they are substantiated by test and analysis and the submission of a report by the licensed or registered professional architect or engineer establishing that the proposed construction under a one hundred (100) per cent overload of the foundation is safe against failure of the pile and soil materials and showing that the probable total magnitude and distribution of settlement to be expected under design conditions will not result in instability of the building or stresses in the structure in excess of the allowable values permitted by this code. However, the allowable pile load shall not exceed twice the value indicated in Section 734.7.

## SECTION 735.0 TIMBER PILES

**735.1 Quality:** Timber piles shall conform to the applicable provisions of the standard for Round Timber Piles, ASTM D-25 listed in Appendix C.

**735.2 Pressure treatment:** Treated foundation piles shall be treated in accordance with the applicable standards listed in Appendix C. The tops of wood piles at "cut-off" shall be given three (3) coats of hot creosote followed by a coat of coal-tar pitch; and the "cut-off" shall be made in sound wood.

**735.3 Untreated piles:** Untreated piles may be used where the cut-off is below the lowest ground water level expected during the life of the structure, but not less than three (3) feet below the existing ground-water level.

**735.4 Allowable stresses:** Allowable unit stresses for timber piles shall be determined in accordance with the standard for Establishing Design Stresses in Round Timber Piles, ASTM D-2899, listed in Appendix C.

**735.5 Allowable loads:** The loads on wood piles shall not exceed the allowable load computed in accordance with Section 734.0.



**735.6 End bearing piles:** Any sudden decrease in driving resistance of an end bearing timber pile shall be investigated with regard to the possibility of damage; and if the sudden decrease in driving resistance cannot be correlated to bearing data, the pile shall be removed for inspection or rejected.

### SECTION 736.0 PRECAST CONCRETE PILES

**736.1 Concrete strength:** A precast concrete pile shall not be driven until the concrete has attained a compressive strength of not less than three thousand (3,000) pounds per square inch (psi) based on tests of cylinders cast from the same batches and cured under the same conditions as the pile concrete.

**736.2 Design:** The piles shall be designed and reinforced in accordance with the applicable reinforced concrete regulations cited in Appendix B. When designed as short columns under the provisions of Section 734.3, the design moment in the pile shall be that resulting from analysis or from an eccentricity of five (5) per cent of the pile thickness, whichever is greater. After casting, such piles shall be handled, driven and loaded to avoid all overstressing or injury. If for any reason the pile is injured, or, the reinforcement is exposed, its use shall be condemned. The lateral reinforcement at both ends of the pile shall be spaced sufficiently close to resist impact stresses due to driving and not more than three (3) inches on centers. When driven to rock, all precast concrete piles shall be reinforced with an approved metal shoe.

**736.3 Protection:** A minimum covering of two (2) inches of concrete shall be provided over all reinforcements, except that for piles to be subjected to the action of sea water, waves or other severe exposure, a three (3) inch protective covering shall be furnished in the zone of such exposure.

### SECTION 737.0 CAST-IN-PLACE CONCRETE PILES

**737.1 Concrete strength:** All concrete for cast-in-place piles shall develop a compressive strength of not less than twenty-five hundred (2500) psi at twenty-eight (28) days. The concrete shall be deposited in a continuous operation so as to insure a full-sized pile without voids or segregation. All concrete shall be placed in the dry; except when the bottom of the pile is sealed by depositing concrete by tremie or other approved method, after removing all soil and other foreign matter.

**737.2 Design:** When designed as short columns under the provisions of Section 736.3, the design moment in the pile shall be that resulting from analysis or from an eccentricity of five (5) per cent of the pile thickness, whichever is greater.

**737.3 Reinforcement:** Except for dowels, all reinforcements, if re-

quired, shall be designed and installed as an assembled unit, and a reinforcement shall not be placed within one (1) inch of a protective metal casing. If a permanent casing is not used, the protective coating of concrete shall be not less than two (2) inches thick; except when subjected to severe exposure, it shall be not less than three (3) inches.

**737.4 Inspection:** Previous to the placing of concrete, full facilities shall be provided for inspecting the shell and other unfilled space of each pile.

### SECTION 738.0 STEEL PIPE AND TAPERED TUBULAR PILES

**738.1 Concrete strength:** Concrete-filled pipe and tapered tubular piles may be driven open-ended or closed-ended. Pipe or tapered tube piles driven with closed ends shall be treated as cast-in-place concrete piles and shall be governed by the same regulations applicable thereto with suitable load-bearing allowance for the metal casing. Concrete shall have a minimum compressive strength of twenty-five hundred (2500) psi at twenty-eight (28) days' age. When driven open-ended to rock, concrete shall not be deposited until the pipe shall have been cleaned free of all soil or loose rock chips and satisfactory proof furnished of the condition of the rock. The concrete shall be deposited either in the dry, or by means of tremie, or by other approved process.

**738.2 Steel pipe:** All steel pipe and tapered tubing shall conform to the applicable standards listed in Appendix C for welded and seamless steel pipe and tubes and for hot rolled carbon steel sheets. The yield point used in the design of steel casings shall be that of the fabricated element as determined by test.

**738.3 Design:** When reinforcement is required, it shall be installed as an assembly unit or may consist of one (1) or more rolled structural shape cores complying with the applicable standards listed in Appendix B. A minimum clearance of one (1) inch shall be maintained between the reinforcement and the enclosing shell.

#### 738.4 Minimum dimensions

**738.4.1 Open-ended pipe piles:** Pipe to be installed open-ended shall have a nominal outside diameter of not less than ten (10) inches. Minimum nominal wall thickness for diameters between ten (10) and fourteen (14) inches shall be one-quarter ( $\frac{1}{4}$ ) inch, and for diameters of fourteen (14) inches or more shall be three-eighths ( $\frac{3}{8}$ ) inch. Pipe of less wall thickness may be installed open-ended if a cutting shoe is provided to protect the tip from injury during driving.

**738.4.2 Closed-ended pipe piles:** Steel pipe piles installed with ends closed for concrete-filled steel pipe piles shall have a minimum nominal wall thickness of ten one-hundredths (0.10) inch. A pile of uniform section shall not have a nominal outside diameter of less than eight (8) inches.

Ends shall be closed with flat plate, forged or cast steel conical point, or other end closure of approved design.

**738.5 Splices:** All splices of the steel section shall comply with Section 732.5 and shall be designed to insure true alignment of the shells and uniform transmission of load from one pipe length to another.

### SECTION 739.0 CAISSONS

**739.1 Construction:** Caissons shall consist of a shaft section of concrete-filled pipe or other approved steel sheet extending to bed rock with an uncased socket drilled into the bed rock which is filled with concrete thoroughly bonded to the rock wall. The caisson may be provided with a structural steel core or other suitable reinforcement, installed so as to deliver its load to the rock through the socket filling. When such steel core is provided, it shall be bedded in cement grout at the base of the rock socket before initial set.

**739.2 Steel shell:** The steel shell shall be seamless or welded steel pipe with a minimum yield point of thirty-three thousand (33,000) psi fitted with an approved cutting shoe and structural cap, or with other approved means of transmitting the superstructure load. None but the top section of the pipe shall be less than forty (40) feet in length. The minimum diameter shall be twenty-four (24) inches and the minimum shell thickness shall be five-sixteenths ( $\frac{5}{16}$ ) inches. Steel shall be protected under the conditions specified in Section 733.0. Splices shall comply with Section 732.8.

**739.3 Concrete fill:** The concrete fill of caissons shall be controlled concrete, with a compressive strength of not less than twenty-five hundred (2500) pounds per square inch at twenty-eight (28) days, deposited with a slump of not more than six (6) inches. When deposited in water, the concrete shall be placed with an approved bottom dump bucket or tremie to eliminate segregation.

**739.4 Rock socket:** The socket shall be into sound rock, and shall be thoroughly cleaned of all foreign matter and loose rock. After examination and approval of the rock surface, the concrete fill shall be deposited in the dry or by an approved method under a water seal. The depth of socket shall be adequate to develop the full load-bearing capacity of the caisson on the approved spread area of distribution within the limitations of Table 720 and without overlapping of stress cones.

**739.5 Reinforcing core:** Structural steel cores used for reinforcement shall not exceed in area twenty-five (25) per cent of the gross caisson section. The minimum clearance between structural core and shell shall be two (2) inches. When such cores are installed in more than one (1) length, they shall be assembled to develop the full compressive strength of the section. In all cases not less than one (1) inch of covering shall be provided around any reinforcement.

**739.6 Alignment:** Caissons shall not be more than two (2) per cent of the length out of plumb.

**739.7 Spacing:** The minimum center-to-center spacing between caissons when a steel core is not used shall be twice the diameter of the shell, and when reinforced with a core such spacing shall be not less than two and one-half ( $2\frac{1}{2}$ ) times the diameter.

#### SECTION 740.0 STRUCTURAL STEEL PILES

**740.1 Steel:** The steel in structural steel pile sections shall have a minimum nominal thickness of metal of three-eighth ( $\frac{3}{8}$ ) inches. When of H section, the flange projection shall not be more than fourteen (14) times the minimum thickness of metal. The flange width shall be not less than eighty (80) per cent of the depth of the section. The nominal depth in the direction of the web shall not be less than eight (8) inches.

**740.2 Splices:** Splices of rolled steel sections shall comply with Section 732.8.

**740.3 Protection:** Structural steel piles shall be protected under the conditions specified in Section 733.0, or due allowance shall be made for corrosion as therein specified.

#### SECTION 741.0 COMPOSITE PILES

**741.1 Design:** Composite piles consisting of two (2) or more approved pile types shall be designed to meet the conditions of installation.

**741.2 Limitation of load:** The maximum allowable load shall be limited by the capacity of the weakest section incorporated in the pile.

**741.3 Splices:** Splices between concrete sections and steel or wood sections shall be designed to prevent separation of the sections both before and after the concrete portion has set, and to insure the alignment and transmission of the total pile load. Splices shall be designed to resist uplift due to upheaval during driving of adjacent piles and shall develop the full compressive strength and not less than fifty (50) per cent of the strength in tension and bending of the weaker section.

#### SECTION 742.0 SPECIAL PILES AND CAISSONS

**742.1 General:** Types of piles or caissons not specifically covered by the provisions of this code may be permitted provided sufficient test data, design and construction information is filed for the approval of any new type of pile, caisson or soil consolidation system by vibro-flotation, wick-drainage, electric, chemical, pressure or impact methods. Before approving new types or methods for actual use, the building official shall require complete test demonstrations on the site to determine the adequacy of design and the suitability of method of installation.

ARTICLE 8—Part A

MATERIALS AND TESTS

SECTION 800.0 GENERAL

**800.1 Scope:** The provisions of this article shall govern the quality, workmanship and requirements for all materials and methods and the minimum specifications for enclosure walls and wall thickness hereafter used in the construction of buildings and structures. All materials and methods of construction shall conform to the approved rules and the standards for materials and tests and the requirements of accepted engineering practice as herein listed.

Appendix B	Accepted Engineering Practice
Appendix C	Material Standards
Appendix D	Structural Unit Test Standards
Appendix E	Structural Assembly Test Standards
Appendix F	Durability Test Standards
Appendix G	Fire Test Standards
Appendix H	Standard Time-Temperature Test Controls
Appendix I	Fire Protection Standards

**800.2 Accepted engineering practice:** The quality, use and installation of all materials and methods of building construction shall be controlled by the standards of accepted engineering practice as listed in Appendix B except where otherwise specifically provided in this code.

**800.3 Material standards:** All building units used in wall, partition and floor construction and for fireproofing or other insulation purposes shall comply with the applicable standards listed in Appendix C.

**800.4 New materials:** All new building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this article and in the approved rules to determine its character, quality and limitations of use.

**800.5 Used materials:** The use of all second-hand materials which meet

the minimum requirements of this code for new materials shall be permitted.

**800.6 Alternate test procedure:** In the absence of approved rules or other accepted standards, the building official shall make or cause to be made the necessary tests and investigations, or he shall accept duly authenticated reports from recognized authoritative sources in respect to the quality and manner of use of new materials or assemblies as provided in Section 108.0. The cost of all tests and other investigations required under the provisions of this code shall be borne by the applicant.

## **SECTION 801.0 BASIC CLASSIFICATION OF CONSTRUCTION MATERIALS**

**801.1 General:** All materials and methods used in the design and construction of buildings and structures shall be classified as controlled materials and ordinary materials as defined in Sections 201.0 and 719.0. The design and construction shall be based on the assumptions, limitations, and methods of stress determination of recognized design procedures.

## **SECTION 802.0 TESTS**

**802.1 Test standards:** All structural units and assemblies shall be tested in accordance with the standards listed in Appendices D, E and F. In the absence of test procedures governing any specific material or method of construction, the building official shall accept authenticated reports from recognized authoritative sources which meet the requirements of this code.

**802.2 Strength tests:** To determine the safe uniformly distributed working load, when not capable of design by accepted engineering analysis, or to check the adequacy of the structural design of an assembly when there is reasonable doubt as to its strength or stability, every system of construction, sub-assembly or assembled unit and its connections shall be subjected to strength tests prescribed in this code, or to such other tests acceptable to the building official that simulate the loads and conditions of application that the completed structure will be subjected to in normal use. Structural load determinations shall include transverse floor and roof, wall compression and racking, concentrated load, plaster bond, puncture penetration and soil tests.

**802.2.1 Strength tests for glass:** The working strength of glass for any location in which it is required to withstand wind or impact loads shall be determined according to the following design procedure and criteria.

1. Design for wind loads by Section 857.5.4.
2. Design for impact loads of fully-tempered, laminated and wired glass shall comply with the requirements of the standard listed in Appendix B.

**802.3 Durability and endurance tests:** Whenever required by the building official or specified herein or in the approved rules, the material or construction shall be subjected to sustained and repetitive loading to determine its resistance to fatigue, and to tests for durability and weather resistance.

**802.4 Maintenance test:** In addition to durability and endurance tests, tests of all materials shall be made to assure the maintenance of the standards of approved materials when reasonable doubt exists as to quality and when required by the building official.

**802.5 Workmanship test:** All work shall be conducted and completed in an acceptable manner, so as to secure the results intended in all sections of this code. Whenever there is reasonable doubt as to the stability or structural safety of a completed building or structure or part thereof for the intended use, the building official may require a load test of the building unit or portion of the structure in question. Such existing structure shall be subjected to a superimposed load equal to two (2) times the design live load. The test load shall be left in place for a period of twenty-four (24) hours. If during the test, or upon removal of the test load, the structure shows evidence of failure, the building official shall order such reinforcement or modifications deemed necessary to insure adequacy of the structure for the rated capacity; or in lieu thereof, he may specify a reduced working load to which the structure shall be limited. The structure shall be considered to have successfully met the test requirements if the total deflection does not exceed the theoretical deflection computed by accepted engineering formulae. When the total deflection is greater than such theoretical value, the structure shall be considered safe for the design load, if it recovers seventy-five (75) per cent of the maximum deflection within twenty-four (24) hours after removal of the test load.

**802.6 Tests of service equipment and devices:** Tests of service equipment and accessories shall include proscenium curtain and stage ventilation, Section 417.7; structural load tests, Section 702.0; flues and chimneys, Section 1002.0; boilers, the mechanical code listed in Appendix B; electric installations, Section 1502.0; moving stairways, elevator interlocks and safety devices, Section 1602.0; refrigerating equipment, and other mechanical and plumbing systems and devices as required by the mechanical code and the plumbing code listed in Appendix B and all other service tests required by the approved rules.

**802.7 Fire tests:** In the determination of flash points, combustibility, flameresistance and fireresistance rating of construction materials and methods, all tests shall be conducted in conformity to Sections 902.0, 903.0 and 904.0 and the applicable standards listed in Appendices G and I.

**802.8 Prefabricated construction tests:** Prefabricated assemblies or sub-assemblies not capable of design by accepted engineering analysis, shall



meet all the requirements and tests for at-site construction. The floor panels and other prefabricated units shall be assembled to form an integrated test specimen constructed as in practice, of not less than three (3) units in width with two (2) longitudinal joints; and when designed on the assumption of a simple span, such units shall be tested with flat end supports.

**802.9 Test specimens:** The selection and construction of all test specimens and the details of test procedure herein required shall conform to the recognized test procedures listed in the appendices. All test specimens and constructions shall be truly representative of the materials, workmanship and details to be normally applied in practice. When structural or fire-resistance rated properties of the material are dependent upon adequate curing, the age of the specimen shall be not less than seven (7) nor more than twenty-eight (28) days, unless otherwise approved by the building official.

**Note:** Test procedures. Test requirements constitute fundamental performance standards and therefore come within the scope of this code. The detail test specifications and procedures are formulated and defined in the approved rules or by reference to accepted test standards of authoritative test agencies and organizations. Details of test procedures have been omitted from this code, except for essential basic requirements when deemed necessary.

## SECTION 803.0 CONDITIONS OF ACCEPTANCE

**803.1 General:** In evaluating the physical properties of materials and methods of construction when not subject to design by accepted engineering analysis, the structural requirements shall be based on the criteria established by the provisions of the following Sections 803.2 through 803.7.

**803.2 Test load factor:** The test assembly shall sustain without failure superimposed loads equal to two and one-half ( $2\frac{1}{2}$ ) times the design live load.

**803.3 Working load deflection:** Under the approved working load, the deflection of floor and roof assemblies shall not be greater than one three-hundred-sixtieth ( $1/360$ ) of the span for plastered construction; one two-hundred-fortieth ( $1/240$ ) of the span for unplastered floor construction; and one one-hundred-eightieth ( $1/180$ ) of the span for unplastered roof construction.

**803.4 Wall and partition assemblies:** Bearing wall and partition assemblies shall sustain the load test both with and without window framing.

**803.5 Comparative tests:** When not available from existing authoritative test data, the building official may require comparative tests of assemblies of standard traditional forms of construction used for similar purposes to assist in determining the adequacy of the new construction.



**803.6 Concentrated load tests:** When not capable of design, all floor constructions in the use classification groups specified in Table 707 shall be subjected to the concentrated loads therein prescribed when such loading exceeds in stress effect the uniformly distributed load specified for such uses in Table 706.

**803.7 Puncture penetration tests:** All finish floor constructions in which light gage metal or other thin materials are used as the structural floor shall withstand the application of a two hundred (200) pound concentrated load applied to the top surface on an area of one (1) square inch at any point or points of the construction designated by the building official.

#### SECTION 804.0 APPROVALS

**804.1 Written approval:** Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be approved by the building official in writing within a reasonable time after satisfactory completion of all required tests and submission of required test reports.

**804.2 Approved record:** Whenever any material, appliance, equipment, system or method of construction shall have been approved by the building official, a record of such approval, including all the conditions and limitations of its permitted use, shall be kept on file in his office and shall be open to public inspection during business hours.

**804.3 Identification of product:** When identification of a material is necessary for structural safety, the approved material shall be identified by the approved label and the grade mark, trademark or other manufacturer's identification for which official recognition is desired. A drawing of the identification marks shall be filed with the building official and kept in the official records.

**804.4 Heretofore approved materials:** The use of any material already fabricated or of any construction already erected, which conformed to requirements or approvals heretofore in effect, shall be permitted to continue, if not detrimental to life, health or safety of the public.

#### SECTION 805.0 MASONRY CONSTRUCTION UNITS

**805.1 Nominal dimensions:** Dimensions and thicknesses specified in this code are nominal dimensions; actual dimensions may vary from the prescribed minimum in accordance with accepted tolerances in the building industry.

**805.2 Second-hand units:** Brick and other second-hand masonry units may be reused subject to the approval of the building official as to quality, condition and compliance with the requirements for new masonry units. The unit shall be good, whole, sound material, free from cracks and other

defects that would interfere with its proper laying or use; and shall be cleaned free from old mortar before reuse.

### SECTION 806.0 BRICK UNITS

**806.1 General:** All clay, shale and sand-lime brick shall be selected on the appropriate grade specified by the applicable standards. Brick in contact with the ground and subject to water, frost and freezing action, shall have a minimum compressive strength of three thousand (3,000) pounds per square inch (psi); when subject to frost without danger of water saturation, a minimum compressive strength of twenty-five hundred (2500) psi; and when not subject to severe weathering or when used as a back-up in exterior walls or for interior construction, a minimum compressive strength of fifteen hundred (1500) psi. Underburned clay brick shall not be used in isolated brick piers, nor in any part of a building exposed to the weather, nor in a bearing wall which is more than forty (40) feet in height.

### SECTION 807.0 STRUCTURAL CLAY TILE UNITS

**807.1 Load-bearing wall tile:** Load-bearing wall tile for general masonry use exposed to weathering shall have a minimum compressive strength on the gross area of not less than fourteen hundred (1400) psi when tested with cells vertical, and not less than seven hundred (700) psi when tested with cells horizontal; and for use with an approved weather-protective veneer, or when not exposed to frost or water action, a minimum compressive strength on the gross area of one thousand (1,000) psi when tested with cells vertical, and not less than seven hundred (700) psi when tested with cells horizontal.

**807.2 Floor tile:** Structural clay floor tile for use in end construction arches shall have a minimum compressive strength on the net area of two thousand (2,000) psi and not less than twelve hundred (1200) psi for side construction arches.

**807.3 Fireproofing tile:** Structural clay tile for use in nonbearing partitions, in fireproofing of structural members and in wall furring shall not be required to meet compressive strength specifications. The fireresistance rating shall be determined by standard test procedure to comply with the requirements of Table 214.

### SECTION 808.0 GLAZED MASONRY UNITS

**808.1 Strength:** All glazed masonry units shall have the following minimum compressive strengths on the gross area when tested as laid in the wall; with cells vertical three thousand (3,000) psi, and with cells horizontal two thousand (2,000) psi.

**SECTION 809.0 CONCRETE UNITS**

**809.1 Quality:** Cast concrete units shall be of sound, compact structure, uniform in shape and free from cracks, warpage or other defects that would impair their serviceability or strength when laid in the wall.

**809.2 Hollow load-bearing units:** Approved hollow load-bearing concrete units for use below grade or unprotected against the weather by stucco, brick or other approved facings or veneers shall have a minimum compressive strength on the gross area of one thousand (1,000) psi; and for protected exterior use and general interior construction not less than seven hundred (700) psi.

**809.3 Hollow nonload-bearing units:** Approved hollow nonload-bearing concrete units shall have a minimum compressive strength on the average gross area of three hundred and fifty (350) psi.

**809.4 Solid load-bearing units:** Approved solid load-bearing concrete masonry units when unprotected against the weather or subject to frost and water action shall have a minimum compressive strength of eighteen hundred (1800) psi, and for protected exterior use or general interior use not less than twelve hundred (1200) psi.

**809.5 Concrete brick:** Approved concrete brick for use when exposed to freezing in the presence of moisture, shall have a minimum compressive strength of twenty-five hundred (2500) psi; and when used as a back-up in exterior walls or for general interior construction, a compressive strength of not less than twelve hundred and fifty (1250) psi.

**809.6 Concrete fireproofing and furring units:** Approved concrete block or tile used in fireproofing or furring, when not exposed to the weather, shall have a minimum compressive strength of three hundred (300) psi of net area tested as laid in practice. When exposed to the weather, the compressive strength shall be not less than seven hundred (700) psi of gross area. All nonbearing units shall be clearly marked to distinguish them from load-bearing units.

**809.7 Concrete floor tile**

**809.7.1 Structural fillers:** Structural concrete filler-block or tile when included in strength calculations in ribbed floor construction shall have webs and shells not less than one (1) inch thick and shall develop an average compressive strength on the net area not less than that of the rib concrete.

**809.7.2 Other fillers:** Removable tile and permanent fillers which are not included in strength calculations shall be of adequate strength to insure integrity of the unit and safety in handling as approved by the building official.

### SECTION 810.0 GYPSUM UNITS

**810.1 General:** Gypsum tile or block shall not be used in bearing walls or in any location exposed to frequent or continuous wetting or in exterior walls unless protected from the weather. Approved gypsum units shall develop a compressive strength of not less than seventy-five (75) psi on the gross area.

### SECTION 811.0 STRUCTURAL GLASS BLOCK UNITS

**811.1 General:** Solid or hollow approved structural glass blocks shall not be used in fire walls, party walls or fire separation walls, or for load-bearing construction. All mortar-bearing surfaces of the block shall be precoated or prepared to insure adhesion between mortar and glass.

### SECTION 812.0 ARCHITECTURAL TERRA COTTA

**812.1 General:** All approved architectural terra cotta units shall be formed with a strong, homogeneous body of hard-burned, weather-resisting clay which gives off a sharp, metallic ring when struck and shall meet the strength and durability requirements of accepted engineering practice. All units shall be formed to engage securely with and anchor to the structural frame or masonry wall.

### SECTION 813.0 NATURAL STONE

**813.1 General:** Natural stone for masonry shall be sound and free from loose or friable inclusions; and shall meet the strength, fireresistance, durability and impact resistance for the intended use in accordance with accepted engineering practice.

### SECTION 814.0 CAST STONE

**814.1 General:** All approved cast stone shall be fabricated of concrete or other approved materials of required strength, durability and fireresistance for the intended use and shall be reinforced where necessary to comply with Section 841.0.

### SECTION 815.0 MORTAR FOR MASONRY

**815.1 Materials:** All portland, natural and masonry cements, quick-lime and hydrated lime for use in masonry mortar and concrete shall meet the minimum strength and durability requirements of the standards listed in Appendices B and C.

**815.2 Mortar types and proportions:** Mortar for masonry construction shall conform to one (1) of the following types shown in Table 815.2 and

shall be mixed to a consistent workability in the specified proportions measured by volume with clean fresh water free from harmful amounts of acids, alkalis, oils or organic materials; and with approved aggregates composed of hard, strong, durable mineral particles well graded from fine to coarse, free from injurious amounts of acid, alkalis, oils, saline, organic and other deleterious substances in accordance with accepted engineering practice. Masonry mortars shall have a flow after suction of not less than seventy (70) per cent.

**Table 815.2**  
**MORTAR PROPORTIONS (PARTS BY VOLUME)**

Mortar type	Portland cement	Masonry cement	Hydrated lime or lime putty		Damp loose aggregate
			Min.	Max.	
M	1	—	—	¼	Not less than 2¼ and not more than 3 times the sum of the volumes of the cements and lime used.
S	1	1	¼	½	
N	½	1	—	—	
O	1	—	½	1¼	
	—	1	—	—	
	1	—	1¼	2½	

**815.3 Types of mortar permitted:** Unit masonry shall be laid in mortar of the following types listed in Table 815.3.

**Table 815.3**  
**MASONRY AND MORTAR TYPES**

Type of masonry	Types of mortar permitted
Masonry in contact with earth	M or S
Grouted and filled cell masonry	M or S
Masonry above grade or interior masonry	
Piers of solid units	M, S, or N
Piers of hollow units	M or S
Walls of solid units	M, S, N or O
Walls of hollow units	M, S or N
Cavity walls and masonry bonded hollow walls	
Design wind pressure exceeds 20 psf	M or S
Design wind pressure 20 psf or less	M, S or N
Glass block masonry	S or N
Nonloadbearing partitions and fireproofing	M, S, N, O or Gypsum
Gypsum partition tile or block	Gypsum
Fire brick	Refractory air-setting mortar
Linings of existing masonry, above or below grade	M or S
Masonry other than above	M, S or N

**815.4 Special mortars:** The building official may approve other special masonry mortars in place of the mortar types listed in Section 815.2, provided they develop the minimum compressive strengths specified for the respective mortars they replace. The strength classification of a special

mortar or special mix may be determined by compressive strength tests with the materials and in the proportions representative of those to be used in actual practice. The allowable unit working stresses in the masonry shall not be more than one-fourth ( $\frac{1}{4}$ ) the average ultimate compressive strength of the assembled test samples.

**815.5 Gypsum mortar:** Gypsum mortar shall be composed of one (1) part of unfibered calcined neat gypsum to not more than three (3) parts sand by weight. Only gypsum mortar shall be used with gypsum tile and block units.

**815.6 Mortars for ceramic wall and floor tile:** Portland cement mortars for installing ceramic wall and floor tile shall be of the following compositions indicated in Table 815.6.

**Table 815.6**  
**CERAMIC TILE MORTAR COMPOSITIONS**

Walls:	Scratchcoat	1 cement; 1/5 hydrated lime; 4 dry or 5 damp sand
	Setting bed and leveling coat	1 cement; 1/2 hydrated lime; 5 damp sand to 1 cement; 1 hydrated lime; 7 damp sand
Floors:	Setting bed	1 cement; 1/10 hydrated lime; 5 dry or 6 damp sand; or 1 cement; 5 dry or 6 damp sand
Ceilings:	Scratchcoat and setting bed	1 cement; 1/2 hydrated lime; 2 1/2 dry sand or 3 damp sand

**815.6.1 Dry-set portland cement mortars:** Premixed prepared portland cement mortars, requiring only the addition of water, may be used in the installation of ceramic tile if complying with the Standard Specification for Dry-set Portland Cement Mortar listed in Appendix C. Dry-set mortars which are labeled for use with a particular type of tile, such as glazed wall tile, ceramic mosaics, pavers, or quarry tile, shall not be used to set other types of tile for which they are not intended. The shear bond strength for tile set in such mortar shall be as required for the kind of mortar used when tested in accordance with the standard. Mortars which are not restricted by their labeling to particular types of the tile shall pass all of the shear tests listed in the standard. Tile set in dry-set portland cement mortar shall be installed in accordance with the standard for Ceramic Tile Installed with Dry-set Portland Cement Mortar listed in Appendix B.

**815.7 Organic adhesives:** Water-resistant organic adhesives complying with Standard for Organic Adhesives for Installation of Ceramic Tile listed in Appendix C may be used in the installation of ceramic tile. The shear bond strength shall be not less than forty (40) psi for Type I adhesive, and not less than twenty (20) psi for Type II adhesive, when tested in accor-

dance with Standard for Organic Adhesives for Installation of Ceramic Tile listed in Appendix C. Tile set in organic adhesives shall be installed in accordance with the Standard Specifications for Ceramic Tile Installed with Water-resistant Organic Adhesives listed in Appendix B.

**815.8 Epoxy mortar:** Ceramic tile may be set and grouted with epoxy complying with the Standard Specifications for Chemical Resistant, Water Cleanable Tile-setting and Grouting Epoxy listed in Appendix C. Tile set in epoxy shall be installed in accordance with the Standard Specifications for Ceramic Tile Installed with Chemical Resistant, Water Cleanable Tile-setting and Grouting Epoxy listed in Appendix B.

## SECTION 816.0 CONCRETE AGGREGATES

**816.1 Aggregate quality:** All concrete aggregates shall meet the standard specifications of accepted engineering practice for organic impurities, soundness, mortar strength, durability, weather-resistance, fireresistance rating and wearing qualities.

**816.2 Fireresistance rating:** Coarse aggregate in concrete shall be rated in respect to the fireresistance of concrete made therewith on the basis of performance in fire test on building elements such as columns, floors, partitions and walls conducted in accordance with standard fire test specifications applicable to such test. Protective coverings of encasements of concrete for steel in fireresistance rated construction shall likewise be selected on the basis of performance in applicable standard fire tests. All concrete constructions shall meet the requirements of Article 9 as regulated by the provisions of Table 214.

**816.2.1 Grade 1 concrete:** Grade 1 concrete shall mean concrete made with aggregates such as blast-furnace slag, burned clays, and calcareous, igneous, and most silicate crushed stones and gravels and shales, as well as any other aggregates performing as required by this code for the appropriate construction when tested in accordance with Standard Methods of Fire Tests of Building Construction and Materials listed in Appendix G.

**816.2.2 Grade 2 concrete:** Grade 2 concrete shall mean concrete made with aggregates such as cinders and crushed stones and gravels composed essentially of quartz and quartzite cherts as well as any other aggregates performing as required by this code for the appropriate construction when tested in accordance with Standard Methods of Fire Tests of Building Construction and Materials listed in Appendix G.

**816.3 Size of aggregates:** Fine aggregates shall meet all the requirements of the approved rules and shall be well graded from fine to coarse. Coarse aggregates shall not exceed one-fifth ( $\frac{1}{5}$ ) of the narrowest dimension between sides of the form nor three-fourths ( $\frac{3}{4}$ ) of the minimum clear spacing between reinforcing bars.

**816.4 Special aggregates:** Special aggregates, including among others, perlite, vermiculite and other processed mica, pumice, lava, tufa, volcanic glass, slag, coke, expanded clay and shale used in concrete and plaster construction shall meet all the requirements of the approved rules and shall be classified in their respective fireresistance rating grades as determined by test. When used for fire protection purposes only, the building official may waive mortar strength requirements for such aggregates providing the concrete is shown by test to have adequate strength for the intended use.

### SECTION 817.0 READY-MIX CONCRETE

**817.1 Control:** Ready-mixed concrete for use in ordinary or in controlled materials procedure shall conform to Section 841.0 for reinforced concrete and to the applicable standards listed in Appendix C.

**817.2 Transportation:** Ready-mixed concrete shall be transported in approved conveyances which insure delivery of the concrete at the site in a plastic, workable and unhardened state. The maximum amount of concrete hauled in an agitator shall not exceed the approved rating of the conveyance; and the period of delivery shall not exceed the time in which loss of plasticity may occur and generally not more than one and one-half (1½) hours.

**817.3 Ordinary materials procedure:** When ready-mix is used under the ordinary materials procedure, either the cement content in bags per yard of concrete together with the maximum allowable water content, or the compressive strength and maximum permissible slump shall be specified.

### SECTION 818.0 STRUCTURAL WOOD GLUES

**818.1 Quality of glue:** Glues used in structural assemblies of built-up or laminated lumber sections shall develop the full strength of the wood, shall not produce decomposition or deleterious chemical reaction in the wood structure and shall not be attractive to vermin.

**818.2 Manufacturers' requirements:** Approved structural glues shall be handled, mixed and applied as prescribed by the manufacturer and the gluing shall be done only in accordance with the timber construction standards listed in Appendix B.

**818.3 Types of glue:** Structural glues shall be classified as described in the following Sections 818.3.1 and 818.3.2.

**818.3.1 Group 1 glues:** For general interior use or for exterior use protected against the weather, Group 1 glues shall include casein glue with mold-resistant preservative, urea-resin glue, phenol or phenol-resorcinol resin glue and any other glue meeting the requirements of the approved rules for such use.



**818.3.2 Group 2 glues:** For use under full exposure to the weather or for interior use when subjected to high humidity, Group 2 glues shall include resorcinol resin, phenol resin, melamine resin glues and any other glue meeting the requirements of the approved rules for such use.

## **SECTION 819.0 INTERIOR LATHING AND PLASTERING**

**819.1 General:** All interior lathing and plastering shall conform to the standards of accepted engineering practice for lathing, furring and accessories and gypsum and portland cement plastering listed in Appendices B and C; except as may be otherwise provided by statute or in this code for specific materials.

### **819.2 Installation**

**819.2.1 Inspection:** The building official shall be notified not less than twenty-four (24) hours in advance of all plastering work, and plaster shall not be applied until after the lathing or other plaster base has been inspected and approved by him.

**819.2.2 Weather protection:** When plastering work is in progress, the building or structure shall be temporarily enclosed, and in freezing weather the enclosure shall be heated to protect the plaster from injury.

## **SECTION 820.0 EXTERIOR LATHING AND STUCCO**

**820.1 General:** All exterior lathing, plastering and stucco work shall be installed of portland cement or other approved mortar as provided in the standards listed in Appendices B and C, in accordance with accepted engineering practice or as provided in this code for specific materials.

**820.2 Reinforcement:** All stucco work shall be reinforced with approved metal lath or wire fabric except when applied directly to a masonry or concrete base, or when installed on a masonry base which is protected with bituminous surfacing.

**820.3 Minimum weight:** Metal lath, expanded metal and wire reinforcing fabric shall weigh not less than that indicated in the following Table 820.

**820.4 Corrosion resistance:** All metal lath and stucco reinforcing fabric shall be protected with a zinc, or other approved rust-resistive coating or rust-inhibitive paint, or shall be manufactured from approved corrosion-resistive alloys.

**820.5 Sheathing:** Except in back-plastered construction, the studs shall be covered with approved sheathing complying with Section 854.0; or not less than No. 18 Steel Wire Gage (0.048 inch) galvanized wire shall be stretched horizontally at six (6) inch centers and shall be covered with not less than fourteen (14) pound waterproof felt or paper before applying

**Table 820**  
**MINIMUM REINFORCEMENT WEIGHT**

Type of reinforcement	Minimum steel wire gage	Maximum mesh (inches)	Minimum weight (pounds per square yard)
Metal lath . . . . .	—	—	3.4
Expanded metal . . . . .	—	—	1.8
Woven wire . . . . .	18 (0.048 in.)	1	1.74
Woven wire . . . . .	17 (0.054 in.)	1½	1.41
Woven wire . . . . .	16 (0.063 in.)	2	1.47
Welded wire . . . . .	18 (0.048 in.)	4 sq. in.	0.67
Welded wire . . . . .	17 (0.054 in.)	4 sq. in.	0.82
Welded wire . . . . .	16 (0.063 in.)	4 sq. in.	1.10

the reinforced stucco; or an approved paper-backed wire fabric may be used of not less than No. 16 Steel Wire Gage (0.063 inch) galvanized wire with stiffening ribs not more than five (5) inches on centers to which is attached a double layer of fibrous waterproof backing. The mesh opening shall not exceed two by two (2x2) inches.

**820.6 Back-plastered construction:** In back-plastered construction, when spacing of studs exceeds sixteen (16) inches, approved horizontal noncombustible cross-furring at not more than sixteen (16) inch centers shall be first applied; unless approved stiffened lath is used and the frame is adequately stiffened as provided in Section 854.0.

**820.7 Application on masonry base:** When applied directly to masonry or monolithic concrete, the surfaces shall be roughened, hacked or bush-hammered to provide bond, or a preparatory dash coat of portland cement grout shall be applied. The dash coat shall be kept damp for at least two (2) days after application and before applying succeeding stucco coats.

### **820.8 Protection**

**820.8.1 From freezing:** At all times during application and for a period of not less than forty-eight (48) hours after application of each coat, provision shall be made to keep stucco work above fifty (50) degrees F.

**820.8.2 From moisture:** Stucco shall be kept a sufficient height above ground surfaces as provided in Section 854.0 and all sills, coping and projecting courses shall be flashed and provided with drips as therein specified.

## **SECTION 821.0 PLASTERING MATERIALS**

**821.1 General:** All sand, quick-lime, hydrated lime, hair binder, gypsum, keene and portland cements, pozzuolanic cements and aggregates and other materials used in plastering shall be stored, protected and applied in accordance with the standards of accepted engineering practice listed in Appendices B and C and the approved rules.

**821.2 Special cements and plasters:** Approved cements used in plastering may have admixtures of approved plasticity agents added in the manufacturing process or when mixing the plaster at the site in the approved proportions. All premixed special plasters, cements and aggregates shall be packaged and identified with the approved label.

**821.3 Lime plaster:** Lime and hydrated lime plasters for use in base and finish coats shall be applied in accordance with the approved rules and the manufacturers' specifications.

**821.4 Gypsum plaster:** All gypsum plaster shall comply with the standard specifications listed in Appendix C.

**821.5 Gypsum plasters with special aggregates:** When gypsum is used with manufactured aggregates in place of natural sand for plaster, the mixture shall be proportioned and applied in accordance with the manufacturer's recommendations and the applicable standard in Appendix B.

## SECTION 822.0 PLASTER BASES

**822.1 Fiber boards:** Approved fiber boards used as plaster bases shall comply with Section 823.0. The surface of such boards shall be of a rough, fibrous texture to insure mechanical and suction bond; and the boards shall meet the bond and strength tests specified by the standards listed in Appendix C and the approved rules.

**822.2 Gypsum lath:** Except when greater thickness is required for fire-resistance rating under the provisions of Article 9, or as herein specified, gypsum lath used for plastering shall be not less than three-eighths ( $\frac{3}{8}$ ) inch thick and shall comply with the standards listed in Appendix C.

**822.3 Perforated gypsum lath:** Where required to provide specified time-temperature performance, perforated gypsum lath shall be not less than three-eighths ( $\frac{3}{8}$ ) inch thick. The openings shall be equivalent to three-quarter ( $\frac{3}{4}$ ) inch diameter holes for each sixteen (16) square inches of lath surface; or the lath shall be perforated as determined by full size tests for load, strength and fireresistance ratings.

**822.4 Metal lath:** The dimensions and sizes of expanded, ribbed and sheet metal lath shall comply with accepted engineering practice and the standards listed in Appendix B; and shall be fabricated from not less than No. 30 Manufacturer's Standard Gage (0.012 inch) steel sheets. It shall be manufactured from copper-bearing steel, coated with rust-inhibitive paint after cutting, or cut from zinc-coated steel sheets.

**822.5 Wire lath:** All types of wire lath shall comply with accepted engineering practice and the standards listed in Appendix B; and shall be fabricated from woven or welded wire of not less than No. 19 Steel Wire Gage (0.041 inch) with not more than two and one-half ( $2\frac{1}{2}$ ) meshes to the inch. Woven or welded wire reinforcement shall be coated with zinc or rust-inhibitive paint.

**822.6 Paper-backed lath:** Expanded metal or wire lath backed with integral approved paper shall be fabricated from the minimum gages and weights specified in Sections 822.4 and 822.5.

**822.7 Combustible lath:** Wood lath shall be erected horizontally on walls and partitions and ceiling lath shall run in one (1) direction only; but in either case it shall not extend through cross-partitions from room to room. Wood lath shall be not less than one (1) inch wide nor less than five-sixteenth ( $\frac{5}{16}$ ) inches thick and shall comply with all the requirements of accepted engineering practice. The lath joints shall be staggered so that not more than seven (7) laths occur in any one (1) continuous break.

### SECTION 823.0 FIBER BOARDS

**823.1 General:** Insulating boards manufactured with wood or other vegetable fibers used as building boards for sheathing, roof decks, plaster bases, interior wall and ceiling finish, roof insulation or sound deadening, shall be vermin proof, resistant to rot-producing fungi, water-repellent and shall meet the strength and durability tests specified in the standards listed in Appendix C. When required under the provisions of Article 9, the boards shall be protected or treated to develop the required fireresistance rating or flameresistance as determined by test.

**823.2 Jointing:** To insure tight-fitting assemblies, edges shall be manufactured square or shiplapped, beveled, tongue-and-grooved or U-jointed; and shall be installed in accordance with accepted engineering practice.

**823.3 Plaster base:** When used as a plaster base, fiber boards shall be permitted in fireresistive construction complying with the test provisions of Article 9, except where specifically prohibited in fireproof (Type 1) and noncombustible (Type 2) construction.

**823.4 Roof insulation:** When used as roof insulation in all types of construction, fiber boards shall be protected with an approved type of roof covering.

**823.5 Wall insulation:** When installed and firestopped to comply with Article 9, fiberboards may be used for wall insulation in all types of construction. In fire wall and fire separation wall construction, unless treated to be fireretardant as provided in Sec. 904.0 for Class I materials, the boards shall be cemented directly to the masonry or other noncombustible base and shall be protected with an approved noncombustible veneer anchored to the base without intervening air spaces.

**823.6 Dry wall construction:** Where fireresistance ratings are required, provision shall be made for interlocking, lapping or otherwise protecting the joints between adjacent boards to insure smoke and flame tightness.

**823.7 Insulating roof deck:** When used as roof decking in open beam construction fiber board insulating roof deck shall have a minimum nominal thickness not less than one (1) inch.

## SECTION 824.0 PLYWOOD

**824.1 Quality:** All plywood when used structurally shall meet the performance standards and all other requirements of U. S. Product Standard PS 1 listed in Appendix C for the type, grade and identification index or species group of plywood involved and shall be so identified by an approved agency. Working stresses shall conform to the standards of accepted engineering practice as listed in Appendices B and C.

**824.2 Types:** Plywood for interior use may be either of the moisture resistant or exterior type; plywood for exterior use shall be of the exterior waterproof type. Exterior plywood may be applied directly to the framing as a siding, provided it has a nominal thickness of three-eighths ( $\frac{3}{8}$ ) inch. Joints shall occur over framing members, unless wood or plywood sheathing is used or joints are lapped horizontally a minimum of one and one-half ( $1\frac{1}{2}$ ) inches or otherwise made waterproof to the satisfaction of the building official. If plywood is used as lapped siding without sheathing, the wall framing to which it is attached shall be diagonally braced.

**824.3 Spans:** The maximum spans for plywood roof sheathing and subflooring shall be limited by the allowable stresses and deflections for the design live load but shall have not less than the following identification index specified in Table 824.3.1, provided it is continuous over two (2) or more spans and laid with face grain perpendicular to the supports.

**824.3.1 Floor and roof sheathing:** Allowable spans for floor and roof sheathing shall be as specified in the following Table 824.3.1.

**824.3.2 Plywood combination subfloor underlayment:** Allowable spans for combination subfloor underlayment shall be as specified in the following Table 824.3.2.

**824.3.3 Vertical maximum stud spacing:** Stud spacing for vertical sheathing and for use in stress-skin panel or other prefabricated constructions shall be determined by accepted engineering analysis or by the tests prescribed for prefabricated assemblies in Section 802.0.

## SECTION 825.0 WALLBOARDS AND SHEATHING

**825.1 Sheathing:** Sheathing of particleboard, gypsum, processed fiber or other approved materials shall conform to accepted engineering practice. All sheathing shall be identified as to compliance with appropriate standards. When used in frame construction, they shall meet requirements of Sections 854.2 and 854.3. When required to meet fire-resistance ratings, the assembled construction shall comply with Table 214 for structural elements and Article 9 for trim and finishes.

**825.2 Wallboards:** Wallboard of particleboard, gypsum, processed fiber or other approved materials shall conform to accepted engineering practice. All wallboards shall be identified as to compliance with appropriate

Table 824.3.1

**ALLOWABLE SPANS FOR PLYWOOD FLOOR AND ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS<sup>1</sup> (SPAN IN INCHES)**

Panel Identification Index <sup>2</sup> Roof span, roof/floor span	Roof					Floor
	Maximum Span (inches)					Maximum span <sup>5</sup> (inches)
	Thickness (inches)	Edges blocked <sup>3</sup>	Edges unblocked	Total Load	Live Load	
12/0	5/16	12	12	155	150	0
16/0	5/16, 3/8	16	16	95	75	0
20/0	5/16, 3/8	19.2	19.2	75	65	0
24/0	3/8	24	20	65	50	0
24/0	1/2	24	24	65	50	0
30/12	5/8	30	26	70	50	12 <sup>7</sup>
32/16	1/2, 5/8	32	28	55	40	16 <sup>8</sup>
36/16	3/4	36	30	55	50	16 <sup>8</sup>
42/20	5/8, 3/4, 7/8	42 <sup>9</sup>	32	40 <sup>4</sup>	35 <sup>4</sup>	20 <sup>8</sup>
48/24	3/4, 7/8	48	36	40 <sup>4</sup>	35 <sup>4</sup>	24

**Note 1:** These values apply for Structural I and II, C-D and C-C grades only. Spans shall be limited to values shown because of possible effect of concentrated loads.

**Note 2:** Identification index appears on all panels in the construction grades listed in footnote (1).

**Note 3:** Edges may be blocked with lumber or other approved type of edge support.

**Note 4:** For roof live load of forty (40) psf or total load of fifty-five (55) psf, decrease spans by thirteen (13) per cent or use panel with next greater identification index.

**Note 5:** Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless one-fourth (1/4) inch minimum thickness underlayment is installed, or finish floor is twenty-five thirty-seconds (25/32) inch wood strip. Allowable uniform load based on deflection of one three-sixtieth (1/360) of space is one hundred sixty-five (165) psf.

**Note 6:** Plywood roof sheathing continuous over two or more spans may be placed with face grain parallel to supports spaced not over twenty-four (24) inches on center if all panel edges are blocked or other approved type edge support is provided, and if live loads do not exceed twenty-five (25) psf for one-half (1/2) inch Structural I (4-ply) and one-half (1/2) inch 5-ply in other grades, or forty (40) psf for one-half (1/2) inch Structural I (5-ply) and five-eighths (5/8) inch 5-ply in other grades.

**Note 7:** May be sixteen (16) inches, if twenty-five thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

**Note 8:** May be twenty-four (24) inches if twenty-five thirty-seconds (25/32) inch wood strip flooring is installed at right angles to joists.

**Note 9:** For joists spaced twenty-four (24) inches on center plywood sheathing with Identification Index Numbers 42/20 or greater can be used for subfloors when supporting one and one-half (1 1/2) inches of lightweight concrete.

standards. Wallboard shall conform to the standards of accepted engineering practice for gypsum or processed fiber wallboard interior finishes, listed in Appendices B and C. When required to meet fireresistance ratings, the assembled construction shall comply with Table 214 for structural elements and Article 9 for trim and finishes.

**825.2.1 Water resistant gypsum backer board:** In all areas subjected to repeated damp conditions and moisture accumulation such as bath tub and shower compartments, water resistant gypsum backer board (ASTM C630) shall be used as a substratum unless protected with a moisture proof and vapor proof covering.

**Table 824.3.1.A**  
**ALLOWABLE LOADS FOR PLYWOOD ROOF SHEATHING**  
**CONTINUOUS OVER TWO OR MORE SPANS AND**  
**FACE GRAIN PARALLEL TO SUPPORTS\***

	Thickness	No. of plies	Span	Total load	Live load
Structural I	1/2	4	24	35	25
	1/2	5	24	55	40
Other grades covered in PS 1	1/2	5	24	30	25
	5/8	4	24	40	30
	5/8	5	24	55	45

\*Uniform load deflection limitations: 1/180 of span under live load plus dead load, 1/240 under live load only. Edges shall be blocked with lumber or other approved type of edge supports.

**Table 824.3.2**  
**ALLOWABLE SPANS FOR PLYWOOD COMBINATION SUBFLOOR-UNDERLAYMENT,<sup>1</sup>**  
**PLYWOOD CONTINUOUS OVER TWO (2) OR MORE SPANS AND FACE GRAIN PERPENDICULAR**  
**TO SUPPORTS (THICKNESS IN INCHES)**

Species groups	Maximum spacing of joists (inches)		
	16	20	24
1	1/2	5/8	3/4
2, 3	5/8	3/4	7/8
4	3/4	7/8	1

**Note 1.** Applicable to underlayment grade, C-C (plugged) and all grades of sanded exterior type plywood. Spans limited to values shown because of possible effect of concentrated loads. Allowable uniform load based on deflection of one three hundred sixtieth ( $\frac{1}{360}$ ) of span is one hundred twenty-five (125) psf. Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless one-fourth ( $\frac{1}{4}$ ) inch minimum thickness underlayment is installed, or finish floor is twenty-five thirty-seconds ( $\frac{25}{32}$ ) inch wood strip. If wood strips are perpendicular to supports, thicknesses shown for sixteen (16) inch and twenty (20) inch spans may be used on twenty-four (24) inch span. Except for one-half ( $\frac{1}{2}$ ) inch, underlayment grade and C-C (plugged) panels may be of nominal thickness one thirty-second ( $\frac{1}{32}$ ) inch less than the nominal thicknesses shown when marked with the reduced thickness.





## **ARTICLE 8—Part B**

### **STEEL, MASONRY, CONCRETE, GYPSUM AND LUMBER CONSTRUCTION**

#### **SECTION 826.0 STRUCTURAL STEEL CONSTRUCTION**

**826.1 General:** Structural steel construction used in all buildings and structures shall be fabricated from materials of uniform quality, free from defects that would vitiate the strength or stability of the structure. Workmanship, design, fabrication, transportation and erection shall conform to accepted engineering practice as defined by the standards listed in Appendix B.

**826.2 Plans:** Design plans drawn to appropriate scale shall show the size, section and relative locations of all structural members with floor levels, column centers and all offsets fully dimensioned; and the design loads shall be clearly indicated for all parts of the building or structure.

**826.3 Temporary and special stresses:** Due provision shall be made in the design for temporary stresses occurring during erections and for the influence of special loads producing impact or vibrations as provided in Section 709.5. Stresses caused by eccentric loading shall be fully provided for; and eccentric details shall be shown on the design and shop drawings.

**826.4 Shop drawings:** Complete shop drawings shall be prepared in conformity to best modern practice in advance of the actual fabrication. Such drawings shall clearly distinguish between shop and field rivets, bolts and welds in all connections and details.

**826.5 Welding:** All welded construction shall be designed and supervised by engineers experienced and skilled in welded construction and the welded work shall be performed by qualified and approved operators in accordance with the standards of accepted engineering practice listed in Appendix B.

**826.6 Painting and special protection:** All painting shall comply with the specifications for design, fabrication, and erection of structural steel for buildings listed in Appendix B. When exposed to highly corrosive fumes or vapors, or subject to destruction from other highly hazardous industrial processes, all structural steelwork shall be protected in accordance with accepted engineering practice and the approved rules.

## SECTION 827.0 FORMED STEEL CONSTRUCTION

**827.1 Design:** The design of all cold-formed steel members and assembled wall, floor and roof panels, used alone or in combination with other structural members, or with component materials, shall be based on allowable unit stresses and maximum deflections in accordance with the standards of accepted engineering practice listed in Appendix B.

**827.2 Secondary structural systems:** Formed steel floor, wall, and roof systems may be designed and constructed to resist all vertical and horizontal moments and shears resulting from lateral forces. Such members, when designed to transmit horizontal shears due to wind or other lateral forces, shall be connected to the supporting structure so as to adequately resist all primary and secondary stresses. When concrete topping or other approved decking is installed in a manner to insure composite action of the assembly, the strength of the composite member may be included in the calculations.

### 827.3 Protection

**827.3.1 Shop coat:** All individual structural members and assembled panels of light gage and formed steel construction, except where fabricated of approved corrosion-resistive metallic steel or of steel having a corrosion-resistive or other approved coating, shall be protected against corrosion with an acceptable shop coat of paint, enamel, or other approved protection.

**827.3.2 Field coat:** After erection where directly exposed to the weather, except when encased in concrete made of non-corrosive aggregates, or where fabricated of approved corrosion-resistive steel, or of galvanized or otherwise adequately protected steel, individual structural members and assembled panels of light gage and formed steel construction shall be given an additional coat of acceptable protection.

**827.3.3 Siding:** Exposed siding or sheathing shall be fabricated of approved corrosion-resistive steel or otherwise protected at the ground level for sufficient height above grade as determined by the depth of average snowfall in the locality, but not less than eight (8) inches.

**827.3.4 Protection at exterior walls:** Floor or roof construction which extends into an exterior wall shall be adequately waterproofed and protected from the weather to prevent corrosion.

**827.4 Tests:** When not capable of design by accepted engineering analysis, the building official shall require tests of the individual or assembled structural units and their connections as prescribed in Sections 802.0 and 803.0. At least three (3) specimens truly representative of the construction to be used in practice shall be subjected to the prescribed test and the mean of the results shall determine the safe working value; provided that any individual test varying more than ten (10) per cent from the mean value shall cause rejection of the series.

## SECTION 828.0 STEEL JOIST CONSTRUCTION

**828.1 General:** Steel joists may be used as secondary members in floor and roof construction, other than around stairwells, shafts and other floor openings in accordance with the standard for steel joist construction listed in Appendix B.

### 828.2 Design

**828.2.1 Loads and stresses:** Connections of all members shall be designed with the minimum possible eccentricity and all secondary stresses shall be included with primary stresses in the design. In buildings subject to heavy concentrations or moving loads, the construction shall be designed to resist the vertical and lateral components of such loads in addition to the live and dead loads specified in Article 7.

**828.2.2 Partitions:** The joists shall be designed to support the dead load of partitions, wherever they occur, in addition to all other imposed dead and live loads.

**828.2.3 Protection:** Painting of steel joists shall be in accordance with the requirements of Section 827.0 for formed steel construction; or the joist shall be dipped in an approved hot asphalt, or shall be protected by painting, dipping or spraying with approved cold asphalt at the place of manufacture.

**828.3 Height and area limitations:** When the main structural frame is designed to resist all horizontal and vertical moments and shears due to lateral forces, and the secondary system consists of steel joists which are attached to the supporting beams and girders of the frame as specified in the standard, steel joist construction of the required fireresistance rating may be used in all buildings within the height limits of Table 305.

**828.4 Tests:** When not subject to accepted engineering analysis as regulated by the standard for steel joist construction, the assembly shall meet the load test requirements specified in Sections 802.0 and 803.0.

## SECTION 829.0 REINFORCING STEEL

**829.1 General:** Metal reinforcement for reinforced concrete, reinforced gypsum concrete, reinforced brickwork and reinforced hollow block construction shall comply with the applicable standards listed in Appendix C.

**829.2 Identification:** All reinforcing bars shall be rolled with raised symbols or letters impressed on the metal identifying the manufacturing mill. When required by the building official, the grade of material shall be identified by satisfactory mill tests. All bundles or rolls of cold-drawn steel wire reinforcement and of one-quarter ( $\frac{1}{4}$ ) inch rounds shall be securely tagged to identify the manufacturer and the grade of steel.

**829.3 High yield steels:** When the yield point of reinforcing bar steel is fifty thousand (50,000) pounds per square inch (psi) or more, the building official shall approve tension stresses in bending and compression stresses in vertical column reinforcement not more than forty (40) per cent of the minimum yield point; but such stresses shall be not more than thirty thousand (30,000) psi. Exceptions to this section may be made for one-way slabs in accordance with Section 841.2 for prestressed concrete reinforcement, and when allowed under the provisions of accepted engineering practice standards listed in Appendix B.

#### **829.4 Column reinforcement**

**829.4.1 Structural steel sections:** The allowable unit stress on structural steel column sections shall be not more than sixteen thousand (16,000) psi.

**829.4.2 Cast iron sections:** All cast iron used as reinforcement in combination with concrete shall be of pit-cast water pipe grade complying with the standards listed in Appendix C; and the allowable unit stress shall be not more than ten thousand (10,000) psi.

**829.4.3 Steel pipe sections:** The allowable unit stress on steel pipe used in concrete-filled pipe columns shall be not more than forty-five (45) per cent of the yield point of the steel, but the combined stress in the shell shall not be more than twenty thousand (20,000) psi.

**829.5 Tests:** When unidentified reinforcement is approved for use under ordinary material procedure, not less than three (3) tension and three (3) bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

### **SECTION 830.0 CAST STEEL CONSTRUCTION**

**830.1 Materials:** Carbon steel casting for building construction shall be cast from steel conforming to the requirements of accepted engineering practice listed in Appendix B and the applicable standards listed in Appendix C. All castings shall be free from injurious blow holes or other defects which would impair the structural strength.

**830.2 Higher strength cast steel:** Higher strength cast steel may be used when approved under controlled material procedure.

**830.3 Welding cast steel:** Cast steel designed for use in welding shall be of weldable grade complying with the approved rules.

### **SECTION 831.0 CAST IRON CONSTRUCTION**

**831.1 Materials:** Cast iron for building construction shall be a good foundry mixture providing clean, tough, gray iron, free from serious blow

holes, cinder spots and cold shuts; conforming to the applicable standards listed in Appendix C for medium gray iron castings.

**831.2 Limitations of use:** Cast iron columns shall not be used where subject to eccentric loads which produce a net tension in the section, nor in any part of a structural frame which is required to resist stress due to wind.

**831.3 Multi-story columns:** Cores of superimposed columns shall be of the same dimensions above and below a splice. When a column of smaller diameter is superimposed over one of larger diameter, the larger column shall be tapered down to the smaller diameter over a length of not less than six (6) inches.

**831.4 Thickness of metal:** The minimum thickness of cast iron shall be not less than herein specified.

**831.4.1 Columns:** In columns, the metal shall be not less than one-twelfth ( $\frac{1}{12}$ ) the smallest dimension of the cross-section and not less than three-quarter ( $\frac{3}{4}$ ) inch.

**831.4.2 Bases and brackets:** In bases and flanges, the metal shall be not less than one (1) inch thick reinforced with fillets and brackets.

**831.4.3 Lintels:** In lintels, the metal shall be not less than three-quarter ( $\frac{3}{4}$ ) inch thick and shall be limited to use on spans of not more than six (6) feet.

**831.5 Inspection:** A cast iron column shall not be erected in place before it has been inspected and approved by the building official. The use of any cast iron column in which blow holes or imperfections reduce the effective area of the cross-section more than ten (10) per cent shall be prohibited. Where required by the building official, three-eighth ( $\frac{3}{8}$ ) inch round inspection holes shall be drilled in the section to expose the thickness of metal for inspection purposes.

## SECTION 832.0 SPECIAL STEELS

**832.1 General:** Alloy, high carbon or other special high strength steels not listed in Appendix C, may be used in the design and construction of buildings and structures as controlled materials as prescribed in Section 721.0.

## SECTION 833.0 LIGHT WEIGHT METAL ALLOYS

**833.1 General:** Aluminum and other approved light weight metals and alloys shall be used for structural purposes in buildings and structures in accordance with the applicable standards listed in Appendix B.

## SECTION 834.0 MASONRY WALL CONSTRUCTION

**834.1 Design:** All masonry construction shall comply with the provi-

sions of this article governing quality of materials and manner of construction; and shall be of adequate strength and proportions to support all superimposed loads within working stresses prescribed in this code and the standards of accepted engineering practice.

**834.2 Wetting of brick:** Brick (clay or shale) shall be wetted when laid unless their gain in weight resulting from partial immersion flatwise in one-eighth ( $\frac{1}{8}$ ) inch of water for one (1) minute is less than twenty-five thousandths (0.025) ounce per square inch of immersed area.

**834.3 Precautions against freezing:** All masonry shall be protected against freezing for not less than forty-eight (48) hours after installation; and shall not be constructed below twenty-eight (28) degrees F. on rising temperatures or below thirty-six (36) degrees F. on falling temperatures, without temporary heated enclosures or without heating materials or other precautions necessary to prevent freezing. Frozen materials shall not be used, nor shall frozen masonry be built upon.

**834.4 Incorporation of combustibles:** Lumber or other combustible materials, except nailing blocks and ornamental timber to an extent permitted by the chasing restrictions of Section 837.0 and the provisions of Section 900.3, shall not be incorporated in masonry walls, except as approved for combustible aggregates or component materials after fire test.

### SECTION 835.0 BONDING OF WALLS

**835.1 General:** Walls of solid, composite and hollow masonry and cavity and other hollow walls shall be bonded in accordance with accepted engineering practice.

**835.2 Rubble stone walls:** All stones in rubble masonry shall be laid on their natural bed and the walls shall be bonded with not less than one (1) through bond stone for each nine (9) superficial square feet of area.

**835.3 Buttresses and piers:** All buttresses shall be bonded into the wall by a masonry bond. The piers and buttresses shall have sufficient strength and stability with sufficient bonding or anchorage between the walls and the supports to resist wind pressure and suction.

**835.4 Intersecting walls and partitions:** Masonry walls and partitions shall be securely anchored or bonded at points where they intersect by one (1) of the following methods.

1. Walls may be bonded by laying at least fifty (50) per cent of the units at the intersection in true masonry bond with alternate units having a bearing of not less than three (3) inches upon the unit below, or they may be anchored with not less than three-sixteenths ( $\frac{3}{16}$ ) inch corrosion-resistant metal wire ties or joint reinforcement at vertical intervals not to exceed two (2) feet, or by other equivalent approved anchorage.

2. Where walls are carried up separately, the interesection shall be toothed or blocked with eight (8) inch maximum offsets and shall be provided with approved metal anchors at vertical intervals of not more than four (4) feet or, when approved, blocking may be eliminated and rigid steel anchors shall be provided, spaced not more than two (2) feet apart vertically.
3. Interior non-loadbearing walls may be bonded or anchored as required by 1 or 2 above or they may be anchored at their intersection, at vertical intervals of not more than two (2) feet, with at least No. 22 Galvanized Sheet Gage (0.034 in.) corrosion-resistant corrugated metal ties seven-eighths ( $\frac{7}{8}$ ) inch in width, or other equivalent approved method of anchorage.

**835.5 Erecting precautions:** Where hollow walls decrease in thickness, a course of solid masonry or of concrete-filled units, or a continuous bearing plate shall be interposed between the thicker and thinner sections. A wall shall not be built up more than twenty-five (25) feet in advance of other walls of the same building or structure unless supported independently at each floor; and all walls shall be temporarily braced during erection.

#### SECTION 836.0 LATERAL BRACING OF WALLS

**836.1 General:** All masonry walls shall be laterally supported by horizontal bracing of floor and roof framing or vertical bracing of columns, buttresses or cross-walls at vertical or horizontal intervals as specified in the accepted engineering practice standards for masonry listed in Appendix B; and provision shall be made in the structure to transfer wind pressures and other lateral forces to the foundations.

#### SECTION 837.0 CHASES AND RECESSES IN BEARING WALLS

**837.1 Where permitted:** Chases and recesses shall be prohibited in any wall less than twelve (12) inches thick or in the required area of piers and buttresses; except that eight (8) inch walls where permitted in residential buildings and the apron under window openings may be chased not more than four (4) inches in depth.

**837.2 Maximum size:** The maximum permitted depth of a chase in any wall shall be not more than one-third ( $\frac{1}{3}$ ) the wall thickness, and the maximum length of a horizontal chase or the maximum horizontal projection of a diagonal chase shall not exceed four (4) feet except as provided in Section 837.5; and except further that the length of the apron below window sills in all walls may equal the width of the window opening; and such aprons in eight (8) inch walls may be chased not more than four (4) inches in depth when waterproofed. The aggregate area of recesses and chases in any wall shall be not more than one-fourth ( $\frac{1}{4}$ ) of the area of the face of the wall in any one (1) story.



**837.3 Fireresistive limitations:** It shall be unlawful to have chases or recesses which reduce the thickness of material below the minimum specified in Article 9 for fire walls, fire separation walls or required fire-protective covering of structural members.

**837.4 Hollow walls:** When chases and recesses are permitted in hollow walls and walls constructed of hollow blocks or tile, they shall be built-in with the wall. It shall be unlawful to cut chases in such walls after erection.

**837.5 Continuous chases:** Horizontal chases for the bearing of reinforced concrete floor and roof slabs may be continuous, provided anchors are installed above and below the floor construction to resist the bending and uplift in the wall due to flexure of the slab.

#### **SECTION 838.0 CORBELED AND PROJECTED MASONRY**

**838.1 Limitations:** A wall less than twelve (12) inches thick shall not be corbeled except to support firestopping around floor framing; and except that eight (8) inch foundation walls may be corbeled to support brick-veneer frame and ten (10) inch cavity walls as provided in Section 869.0. The maximum total horizontal projection of corbels shall be not more than one-half ( $\frac{1}{2}$ ) the thickness of the wall. The maximum projection of one (1) unit shall neither exceed one-half ( $\frac{1}{2}$ ) the depth of the unit nor one-third ( $\frac{1}{3}$ ) its width at right angles to the face which is offset.

**838.2 Hollow walls:** Corbeling of hollow masonry or masonry built of hollow units shall be supported on at least one (1) full course of solid masonry.

**838.3 Molded cornices:** Unless structural support and anchorage is provided to resist the overturning moment, the center of gravity of all projecting masonry or molded cornices shall lie within the middle third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of approved noncombustible material anchored in an approved manner.

#### **SECTION 839.0 BEARING ON HOLLOW UNIT WALLS**

**839.1 Bearing area:** Beam, girder and other concentrated loads shall be provided with a bearing of solid masonry or filled cores of hollow unit masonry at least four (4) inches in height or with a bearing plate of adequate design and dimensions to distribute the load safely on the wall or pier.

**839.2 Closure tile:** All open cells in tiles or blocks at wall ends and at openings shall be filled solidly with concrete for a length of not less than twelve (12) inches, or reversed closure tile shall be used.



**SECTION 840.0 PLAIN CONCRETE**

**840.1 General:** Except for controlled materials, cast-in-place concrete masonry shall contain not more than seven and one-half (7½) gallons of water per sack of cement, and not more than six (6) parts of aggregate for each one (1) part of cement by separate, dry volumetric measure.

**840.2 Design stress:** Plain concrete masonry shall conform to the applicable requirements of Section 841.0 for reinforced concrete, but the allowable working stress in compression shall not exceed twenty-five (25) per cent of the compressive strength, and the extreme fiber stress in bending shall not exceed three (3) per cent of the compressive strength except as provided in the applicable standard listed in Appendix B.

**SECTION 841.0 REINFORCED CONCRETE**

**841.1 Design:** The design of reinforced concrete construction shall be based on the generally accepted theory of flexure and elasticity of materials as applied to reinforced concrete and as specified in Section 842.0 for controlled materials and in Section 843.0 for ordinary materials and in accordance with the standards listed in Appendix B.

**841.2 One-way slabs:** In one (1) way slabs designed in accordance with accepted engineering practice of not more than twelve (12) foot span, the allowable tension in the reinforcement may be increased to fifty (50) per cent of the minimum yield point of the particular kind and grade of reinforcement used when the main reinforcement is three-eighths (¾) inch or less in diameter; but the allowable stress shall not exceed thirty thousand (30,000) pounds per square inch (psi).

**841.3 Cinder concrete:** Cinders shall not be used as coarse aggregate in reinforced concrete structural members, except as provided in Section 844.0.

**841.4 New systems:** Any system of construction which is not covered by, or which conflicts with the requirements of, this code may be approved by the building official on the basis of satisfactory experience records and tests as prescribed by Sections 802.0 and 803.0 and Sections 902.0 and 903.0.

**841.5 Embedded mechanical facilities:** Plumbing and heating piping and electrical conduits may be embedded in reinforced concrete floor and wall construction and in column fireproofing as provided in Section 911.0. Piping for radiant heating purposes may be embedded in the structural floor or wall slabs, or may be installed in a separate concrete layer placed in addition to the required fireproof covering, as approved by the building official. In any case, the required area of reinforcement shall be provided in addition to such piping; and the conduits, pipes or other embedded mechanical facilities shall be so placed as to leave the strength and fireresistance rating of the construction undiminished.

## SECTION 842.0 CONTROLLED CONCRETE

**842.1 General:** When controlled materials procedure is followed in the design and construction of a reinforced concrete building or structure, the allowable working stresses shall conform to accepted engineering practice in accordance with Building Code Requirements for Reinforced Concrete listed in Appendix B. The ultimate compressive strength of the concrete shall not be limited in controlled concrete procedure, provided proper provision is made to limit deflections and cracking.

## SECTION 843.0 ORDINARY CONCRETE

**843.1 General:** When ordinary material procedure is followed in the design and construction of a reinforced concrete building or structure, the allowable working stresses shall be as specified in Appendix K and the design shall conform to accepted engineering practice.

## SECTION 844.0 STRUCTURAL CINDER CONCRETE

**844.1 Aggregates:** Approved cinder aggregates where permitted for use in structural and fireproofing concretes shall consist of clean, well burned cinders, containing a maximum of thirty-five (35) per cent of unburned carbon and not more than one and one-half (1½) per cent of sulphur nor more than a total of five (5) per cent of volatile materials.

**844.2 Cinder concrete proportions:** Structural cinder concrete shall be mixed in the proportions of one (1) part portland cement and not more than seven (7) parts of fine and coarse aggregate measured separately with a compressive strength of not less than eight hundred (800) psi at twenty-eight (28) days' age.

## SECTION 845.0 SHORT SPAN FLOOR FILLING

**845.1 General:** For spans not exceeding ten (10) feet between steel flanges, the safe supporting capacity of concrete floor and roof slabs built as fireresistance rated floor filling between steel beams shall be determined by the provisions of Section 841.2 or in accordance with the approved rules for stone and cinder concrete and other approved fireresistance rated floor filling.

## SECTION 846.0 CONCRETE-FILLED PIPE COLUMNS

**846.1 General:** Concrete-filled pipe columns shall be manufactured from standard, extra strong, or double extra strong steel pipe and tubing, filled with concrete so placed and manipulated as to secure maximum density and to insure complete filling of the pipe without voids.

**846.2 Design:** The safe supporting capacity of concrete-filled pipe

columns shall be computed in accordance with the approved rules or as determined by test.

**846.3 Connections:** All caps, base-plates and connections shall be of approved types and shall be positively attached to the shell and anchored to the concrete core. Welding of brackets without mechanical anchorage shall be prohibited. When the pipe is slotted to accommodate webs of brackets or other connections, the integrity of the shell shall be restored by welding to insure hooping action of the composite section.

**846.4 Reinforcement:** To increase the safe load supporting capacity of concrete-filled pipe columns, the steel reinforcement shall be in the form of rods, structural shapes or pipe embedded in the concrete core with sufficient clearance to insure the composite action of the section, but not nearer than one (1) inch to the exterior steel shell. All structural shapes used as reinforcement shall be milled to insure bearing on cap and base plates.

**846.5 Fireresistance rating protection:** Pipe columns shall be of such size or so protected as to develop the required fireresistance ratings specified in Table 214. When an outer steel shell is used to enclose the fireproof covering, it shall not be included in the calculations for strength of the column section. The minimum diameter of pipe columns shall be four (4) inches except that in frame structures not exceeding three (3) stories or forty (40) feet in height, three (3) inch columns may be used in the basement and as secondary steel members.

**846.6 Approvals:** All details of column connections and their splices shall be shop-fabricated by approved methods and shall be approved only after tests in accordance with the approved rules. Shop-fabricated concrete-filled pipe columns shall be inspected by the building official or by an approved representative of the manufacturer at the plant.

## SECTION 847.0 PNEUMATIC CONCRETE

**847.1 Application:** Mortar or concrete deposited pneumatically shall be applied only with the approval of the building official and shall be protected and cured to prevent the temperature falling below fifty (50) degrees F. or from loss of moisture at the surface. Reinforcement for pneumatic mortar shall be adequate to meet structural requirements and shall consist of round bars or mesh not less than No. 12 Steel Wire Gage (0.016 in. diameter), spaced not less than two (2) nor more than four (4) inches either way, with a gross areas of not less than two-tenths per cent (0.2%) of the cross-sectional area of the mortar layer.

**847.2 General requirements:** Pneumatically placed concrete shall consist of a mixture of fine aggregate and cement pneumatically applied by suitable mechanism, and to which water is added immediately prior to discharge from the applicator. Except as specified in the following sections, pneumatically placed concrete shall conform to the requirements of this code for reinforced concrete.

**847.2.1 Proportions:** The proportion of cement to aggregate, in loose dry volume, shall not be less than one (1) to four and one-half ( $4\frac{1}{2}$ ).

**847.2.2 Water:** The water content at the time of discharge, including moisture in the aggregate, shall not exceed three and one-half ( $3\frac{1}{2}$ ) gallons per sack of cement.

**847.2.3 Mixing:** The cement and aggregate shall be thoroughly mixed prior to the addition of water. At the time of mixing the aggregate shall contain not less than three (3) per cent moisture.

**847.3 Rebound:** Any rebound or accumulated loose aggregate shall be removed from the surfaces to be covered prior to placing the initial or any succeeding layers of pneumatically placed concrete. Rebound may be reused if it conforms to the requirements for aggregate, provided the amount of rebound material used shall not exceed twenty-five (25) per cent of the total aggregate in any batch.

**847.4 Joints:** Unfinished work shall not be allowed to stand for more than thirty (30) minutes unless all edges are sloped to a thin edge. Before placing additional material adjacent to previously applied work, these sloping edges shall be cleaned and wetted.

**847.5 Damage:** Any pneumatically placed concrete which subsides after placement shall be removed.

**847.6 Test cylinders:** Test cylinders of pneumatically placed concrete shall be made in a manner that will permit the blast of air to firmly compact the materials and provide escapement of the air to eliminate possible back pressure. Such cylinders shall be cured and tested as required for reinforced concrete.

## **SECTION 848.0 MINIMUM CONCRETE DIMENSIONS**

**848.1 General:** The protection of reinforced concrete structural elements in buildings and structures of fireproof (Type 1) construction shall be adequate to meet the fire and strength tests of this code; but not less than the minimum dimensions established by the standards of accepted engineering practice. Any floor finish not placed monolithically with floor slabs, shall not be included in the calculations for structural strength.

## **SECTION 849.0 REINFORCED GYPSUM CONCRETE**

**849.1 General:** Reinforced gypsum concrete for use in buildings and structures shall consist of a mixture of calcined gypsum and water, with or without the addition of wood chips, shavings, fiber or other approved aggregates. The wood aggregates and gypsum shall be pre-mixed at the mill, requiring only the addition of water at the job or site. The manufacture, design and construction shall comply with the requirements of the standards of accepted engineering practice listed in Appendix B.

**849.2 Limitations of use:** Gypsum concrete shall not be used where exposed directly to the weather or where subject to frequent or continuous wetting. To prevent saturation or freezing, protection from the weather and from contact with moisture shall be furnished during shipment and storage of prefabricated units, and after erection or pouring at the site.

## **SECTION 850.0 REINFORCED BRICKWORK**

**850.1 General:** All systems of brick masonry reinforced with steel in grouted mortar joints for use in the design and construction of buildings and structures shall conform to the requirements of this section and the standards of accepted engineering practice listed in Appendix B. Reinforced brickwork shall be used only under controlled materials procedure.

**850.2 Design:** The formulae and assumptions used in the design of reinforced concrete shall apply to reinforced brick masonry insofar as they are applicable.

## **SECTION 851.0 REINFORCED HOLLOW BLOCK CONSTRUCTION**

**851.1 General:** Walls constructed of hollow block or other hollow unit masonry, filled solidly with concrete or grout and reinforced with steel rods shall be designed as specified for reinforced brick masonry in Section 850.0.

## **SECTION 852.0 LUMBER AND TIMBER CONSTRUCTION**

**852.1 Design:** Structural lumber and timber and its fastenings shall be adequately designed and assembled to safely sustain all imposed loads. When stress-grade lumber is used and properly identified and controlled, working stresses may be in accordance with the accepted engineering practice standards listed in Appendix B. All lumber used for load supporting purposes shall be identified by the grade mark of a lumber grading inspection agency approved by the building official. Grading practices and identification shall be in accordance with rules published by an agency recognized as being competent. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency approved by the building official may be accepted for precut, remanufactured, or rough sawn lumber; also for sizes larger than three (3) inches nominal thickness.

### **852.2 Minimum dimensions**

**852.2.1 Sizes of structural members:** All lumber sizes specified in this code are nominal sizes. Nominal sizes may be shown on the plans. Computations to determine the required size of members shall be based on the net dimensions (actual sizes).

**852.2.2 Structural posts:** All isolated structural posts shall have a minimum dimension of four (4) inches.

### **852.3 Fabrication**

**852.3.1 Connections:** All connections shall be fabricated with approved timber connectors, bolts, lag screws, spikes, nails or gluing or other approved connecting devices in accordance with accepted engineering practice. Bolted connections shall be snugged up tightly without crushing wood fibers under the washers. All nailed connections shall meet the minimum requirements of Appendix M.

**852.3.2 Cambering:** Trusses and long span girders shall be designed with sufficient camber or other provision shall be made to counteract any possible deflection.

**852.3.3 Cutting and notching:** It shall be unlawful to notch, cut or pierce wood beams, joists, rafters or studs in excess of the limitations herein specified unless proven safe by structural analysis, or suitably reinforced to transmit all calculated loads. Notches in the top or bottom of joists shall not exceed one-sixth ( $\frac{1}{6}$ ) the depth of the member and shall not be located in the middle one-third ( $\frac{1}{3}$ ) of the span. Notches located closer to the supports than three (3) times the depth of the member shall not exceed one-fifth ( $\frac{1}{5}$ ) the depth. Holes bored or cut into joists for piping or electrical cables shall not be closer than two (2) inches to the top or bottom of the joist and the diameter of the hole shall not exceed one-third ( $\frac{1}{3}$ ) the depth of the joist. In studs of bearing walls or partitions, notches or bored holes made to receive piping, electrical conduit, air conditioning or heating duct work or for other fabricating purposes shall not be cut or bored more than one-third ( $\frac{1}{3}$ ) the depth of the stud. When the stud is cut or bored in excess of one-third ( $\frac{1}{3}$ ) its depth it shall be reinforced to be equal in load carrying capacity to a stud notched not more than one-third ( $\frac{1}{3}$ ) its depth.

**852.4 Trimmer and header beams:** When determined necessary by stress analysis, trimmer and header beams shall be hung in approved metal or other approved noncombustible stirrups or hangers, unless supported on a masonry wall or girder. All such beams shall be spiked together.

**852.5 Bearing and anchorage on girders:** All members framing into girders shall be anchored or tied to secure continuity. The ends of all wood beams or joists resting on girders shall bear not less than four (4) inches or shall be supported in approved metal stirrups, hangers or on wood clips or ribbon strips. Beams framing from opposite sides shall lap at least six (6) inches and be bolted or spiked together; and when framing end to end, they shall be secured together by metal ties, straps or dogs.

**852.6 Maintenance:** All connections in the joints of timber trusses and structural frames shall be inspected periodically and bolts and other connectors shall be maintained tight.

**SECTION 853.0 HEAVY TIMBER TYPE CONSTRUCTION**

**853.1 Wood:** All structural wood members, sawn or glued laminated, used in heavy timber type construction shall be stress-grade timbers identified as to grade and strength by authoritative manufacturing, testing or inspection agencies or bureaus. All structural timber members shall have the minimum dimensions specified in Section 217.0 for Type 3A construction.

**853.2 Other structural materials:** Structural steel or reinforced concrete members may be substituted for timber in any part of the structural frame, protected to develop the required fireresistance rating specified in Table 214, but not less than one (1) hour fireresistance rating. Structural members supporting walls shall be protected to afford the same fireresistance rating as the wall supported.

**853.3 Columns:** Columns shall be continuous or superimposed throughout all stories by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by means of metal connectors housed within the contact faces, or by other approved methods. Girders or trusses supporting columns shall have at least one (1) hour fireresistance rating.

**853.4 Floors:** The planks shall be laid so that a continuous line of joints will not occur except at points of support and so that they are not spiked to supporting girders. Flooring shall not extend closer than one-half ( $\frac{1}{2}$ ) inch to walls to provide an expansion joint, but the joint shall be covered at top or bottom to avoid flue action.

**853.5 Beams and girders**

**853.5.1 Wall and girder supports:** Wall plate boxes of self-releasing type or approved hangers shall be provided where beams and girders enter masonry. An air space of one-half ( $\frac{1}{2}$ ) inch shall be provided at the top, end and sides of the member unless approved durable or treated wood is used. Where intermediate beams are used to support a floor, they shall rest on top of the girders, or shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be closely fitted. Wood beams and girders supported by walls required to have a fireresistance rating of two (2) hours or more shall have not less than four (4) inches of solid masonry between their ends and the outside face of the wall and between adjacent beams. Adequate roof anchorage shall be provided.

**853.5.2 Column connections:** Where intermediate beams are used to support a floor, they shall rest on top of the girders, or shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they may be supported by approved metal hangers into which the ends of the beams shall be closely fitted.



**SECTION 854.0 WOOD FRAME CONSTRUCTION**

**854.1 General:** The exterior walls, interior partitions, floors and roofs of wood frame construction shall be designed and constructed to develop adequate strength to resist all vertical and lateral forces due to both dead and live loads. Standard balloon, braced, platform, and post and beam types of construction shall be acceptable framing methods.

**854.2 Wood stud frame**

**854.2.1 Bearing walls:** Posts and studs in bearing walls and partitions shall be designed as columns, with due allowance for lateral support furnished by sheathing, intermediate bracing, horizontal bridging, wall coverings and the floor and roof assemblies. The walls shall be fabricated in such a manner as to provide adequate support for the material used to enclose the building and to provide for transfer of all lateral loads to the foundation, in accordance with Section 803.4.

**854.2.2 Non-bearing walls:** Studs in non-bearing walls and partitions shall not be spaced more than forty-eight (48) inches on centers, and may be erected with the long dimension parallel to the wall, unless otherwise approved after test as an integrated assembly.

**854.2.3 Bracing:** In buildings more than one (1) story in height and where necessary for strength in one (1) story buildings, the corner posts shall be the equivalent of not less than three (3) pieces of two (2) by four (4) inch studs, braced by not less than one (1) piece of one (1) by four (4) inch continuous diagonal brace let into the studs. Bracing may be omitted when diagonal wood sheathing or plywood panels are used, or other sheathing specified in Section 854.3 is applied vertically in panels of not less than four (4) feet by eight (8) feet in area with approved nailing complying with Appendix M. Ledger or ribbon boards used to support joists shall be not less than one (1) by four (4) inches in size, cut into and securely nailed to each stud.

**854.2.4 Mortise and tenon framing:** Where mortise and tenon framing is used, the vertical members of the frame shall be not less than four (4) by six (6) inches in size and shall be designed as a column.

**854.2.5 Multiple stories:** When the frame is more than one (1) story in height and studs and posts are not continuous from sill to roof, the members shall be secured together with approved clips, splices or other connections to insure a continuous, well integrated structure. Sheet metal clamps, ties or clips shall be formed of galvanized steel or other approved corrosion-resistive materials equivalent to No. 20 Galvanized Sheet Gage (0.040 in.) steel sheets for two (2) inch framing members and not less than No. 18 Galvanized Sheet Gage (0.052 in.) for three (3) inch structural members. For four (4) inch and larger members, column splices and beam and girder supports shall comply with Section 853.0.

**854.2.6 Framing over openings:** Headers, double joists, trusses or other



approved assemblies of adequate size to transfer all superimposed loads to the vertical member shall be provided over all window and door openings in bearing walls and partitions.

**854.3 Wall sheathing:** Except as provided in Section 854.4 for weather boarding or when stucco construction complying with Section 820.6 is used, all enclosed buildings shall be sheathed with one (1) of the materials of the following nominal thickness or any other material of equal strength and durability approved by the building official:

Reinforced cement mortar .....	1 inch
Wood sheathing .....	$\frac{5}{8}$ inch
Plywood .....	$\frac{5}{16}$ inch
Gypsum sheathing .....	$\frac{1}{2}$ inch
Fiber boards .....	$\frac{1}{2}$ inch
Particle boards .....	$\frac{3}{8}$ inch

**854.3.1 Paper-backed lath sheathing:** In one- and two-family dwellings and one (1) story commercial buildings with brick or similar veneers, the sheathing may consist of a layer of paper-backed lath complying with Section 820.5 with a one (1) inch intermediate space which shall be mortar filled as each course of veneering is applied.

**854.4 Exterior weather boarding, veneers and condensation:** To secure weather-tightness in framed walls and other unoccupied spaces, the exterior walls shall be faced with an approved weather-resisting covering properly attached to resist wind and rain. The cellular spaces shall be so ventilated as not to vitiate the firestopping at floor, attic and roof levels or shall be provided with interior non-corrodible vapor-type barriers complying with the approved rules; or other means shall be used to avoid condensation and leakage of moisture. The following materials shall be acceptable as approved weather coverings of the nominal thickness specified.

Brick masonry veneers .....	2 inches
Stone veneers .....	2 inches
Clay tile veneers .....	$\frac{3}{4}$ to 1 inch
Stucco or exterior plaster .....	$\frac{3}{4}$ inch
Precast stone facing .....	$\frac{5}{8}$ inch
Wood siding (without sheathing) .....	$\frac{1}{2}$ inch

**Note:** Wood siding of lesser thickness may be used providing such wall covering is placed over sheathing which conforms to Section 854.3.

Protected fiberboard siding .....	$\frac{1}{2}$ inch
Wood shingles .....	$\frac{3}{8}$ inch
Exterior plywood (without sheathing) .....	see Sec. 824.2
Exterior plywood (with sheathing) .....	$\frac{5}{16}$ inch
Asbestos shingles .....	$\frac{5}{32}$ inch
Asbestos cement boards .....	$\frac{3}{8}$ inch

Aluminum clapboard siding .....	0.024 inch
Formed steel siding .....	29 gage (0.017 in.)
Hardboard siding .....	$\frac{1}{4}$ inch
Particleboard (with sheathing) .....	$\frac{3}{8}$ inch
Particleboard (without sheathing) .....	$\frac{5}{8}$ inch

**854.4.1 Masonry veneers:** Veneers of unit masonry shall be attached to the wood frame with at least No. 22 Galvanized Sheet Gage (0.034 in.) corrosion-resistive, corrugated metal ties not less than seven-eighths ( $\frac{7}{8}$ ) inch in width at vertical intervals of not more than sixteen (16) inches and horizontal intervals of not more than thirty-two (32) inches.

**854.4.2 Metal veneers:** Veneers of metal shall be fabricated from approved corrosion-resistive materials or shall be protected front and back with porcelain enamel or shall be otherwise treated to render the metal resistant to corrosion. Such veneers shall be not less than No. 29 (0.017 in.) Galvanized Sheet Gage in thickness mounted on wood or metal furring strips or approved sheathing on the frame construction.

**854.4.3 Height of veneers:** The average height of four (4) inch brick veneer shall be not more than twenty-five (25) feet above its supports on foundation wall or on corbels of masonry or steel; and not more than eighteen (18) feet in height for two (2) inch veneers.

**854.4.4 Nailing:** All weatherboarding and wall and roof coverings shall be securely nailed with aluminum, copper, zinc, zinc-coated or other approved corrosion-resistive nails in accordance with the recommended nailing schedule or the approved manufacturer's standards. Shingles and other weather coverings shall be attached with appropriate standard shingle nails to furring strips securely nailed to studs, or with approved mechanically-bonding nails, except when sheathing is wood not less than one (1) inch nominal thickness or plywood not less than five-sixteenths ( $\frac{5}{16}$ ) inch thick. Wood shingles or shakes attached with approved corrosion-resistive annular grooved nails may be applied over fiberboard shingle backer and fiberboard sheathing when the installation is in accordance with the approved manufacturer's standards listed in Appendix C. Wood shingles or shakes and asbestos shingles or siding may be nailed directly to nail base fiberboard sheathing not less than one-half ( $\frac{1}{2}$ ) inch nominal thickness with approved corrosion-resistive annular grooved nails when the installation is in accordance with the approved manufacturer's standards listed in Appendix C.

**854.5 Foundation anchorage:** Wall sill plates, a minimum of a two-by-four inch (2" x 4") member, shall be sized and anchored to foundation walls or piers and at intermediate intervals as required to resist wind uplift. Anchor bolts shall be a minimum of one-half ( $\frac{1}{2}$ ) inch diameter. The bolts shall be embedded in foundations to a depth of not less than eight (8) inches poured in place concrete, and not less than fifteen (15) inches

in grouted unit masonry. There shall be a minimum of two (2) anchor bolts per section of plate and anchor bolts shall be placed twelve (12) inches from the end of each section of plate with intermediate bolts spaced a maximum of eight (8) feet on center.

#### **854.6 At-grade protection**

**854.6.1 Wood framing:** All exterior wood framework of buildings, whether structural or non-loadbearing, shall be supported on approved foundation walls at least eight (8) inches above the finished grade, and higher when necessitated by greater average snow fall. Where climatic conditions or the geographical location require additional control measures to protect buildings and structures against decay and termite attack, the provisions of Section 874.0 shall be complied with.

**854.6.2 Metal siding:** Exposed metal siding or sheathing shall be protected from corrosion at the ground level by supporting the foundation channel at sufficient height above grade on the concrete apron or other approved water-resisting foundation.

#### **854.7 Floors**

**854.7.1 Bridging:** Except as hereinafter noted, in all floor, attic and roof framing, there shall be not less than one (1) line of bridging for each eight (8) feet of span. The bridging shall consist of not less than one-by-three (1x3) inch lumber, double-nailed at each end, or of equivalent metal bracing of equal rigidity. A line of bridging shall also be required at supports where adequate lateral support is not otherwise provided. Mid-span bridging is not required for floor, attic or roof framing in one- and two-family dwellings (use group R-3) and multi-family dwellings (use group R-2) except when the joist depth exceeds twelve (12) inches nominal and/or when the minimum uniformly distributed live load exceeds forty (40) psf.

**854.7.2 Flooring:** The flooring of wood frame construction shall be of adequate strength and stiffness to support required loads and, where necessary for strength and for lateral support of the building, subflooring shall be provided.

#### **854.8 Roofs**

**854.8.1 Types of decking and sheathing:** Roof deck sheathing shall consist of not less than five-eighths ( $\frac{5}{8}$ ) inch boards or plywood of the thickness specified in Section 824.3, or other approved materials of equivalent strength and rigidity. When open-deck sheathing is used on pitched roofs, it shall consist of not less than one-by-four (1x4) inch roofers spaced not more than six (6) inches on centers or material of equivalent strength and rigidity.

**854.8.2 Wood shingles:** Wood shingles and handsplit shakes complying with the standards listed in Appendix C may be used for roof covering

where permitted in Section 926.0, and may be installed on tight decking or on spaced roof boards.

**854.8.3 Asphalt shingles:** Asphalt shingle roofs shall have an underlay of not less than fifteen (15) pound felt, adequately attached, applied as required for a base sheet. The underlay may be omitted over existing roof or where the slope is five (5) inches to twelve (12) inches or more, or where the shingles are laid not less than three (3) thicknesses at any point.

**854.9 Flashing:** Approved corrosion-resistive flashing shall be provided at top and sides of all exterior window and door openings in such manner as to be leakproof. Similar flashings shall be installed at the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings; under and at the ends of masonry, wood or metal copings and sills; continuously above all projecting wood trim; at wall and roof intersections; under built-in gutters; at junction of chimneys and roofs; in all roof valleys and around all roof openings.

**854.9.1 Building paper:** When veneers of brick, clay tile, concrete or natural or artificial stone are used, fourteen (14) pound felt or paper shall be attached to the sheathing with flashing wherever necessary to prevent moisture penetration behind the veneer.

**854.10 Interior finish:** In all habitable spaces, interior wall and partition surfaces shall be finished with materials which comply with the requirements of Section 920.0 and are of adequate strength to resist a horizontal force of not less than five (5) psf.

## SECTION 855.0 STRESS SKIN PANELS

**855.1 Integrated assemblies:** Approved panels or other integrated assemblies fabricated of dimension lumber with wood stress-coverings glued thereto, or consisting of structural units of metal-covered or molded plywood or other approved plastics, formed and molded into prefabricated load-bearing members shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with accepted engineering practice or meeting the test requirements of Sections 802.0, 803.0 and 804.0.

**855.2 Splices:** Splices and connections between panels shall be weathertight and of sufficient strength to resist two and one-half (2½) times the design live load to which they will be subjected in normal use. The fastenings of covering assemblies to structural studs, ribs or joists shall provide rigidity equivalent to approved gluing. Nailing shall not be acceptable for that purpose.

**855.3 Molded plywood units:** Structural units of plywood or other approved plastics of similar combustible characteristics formed and molded into prefabricated load-bearing members shall conform to the approved rules and shall be identified by the approved label. The design shall be based on accepted engineering analysis confirmed by the tests prescribed in Sections 802.0 and 803.0.

#### **SECTION 856.0 STRUCTURAL GLUED LAMINATED TIMBER AND BUILT-UP WOOD CONSTRUCTION**

**856.1 General:** Buildings and structures may be designed and erected of glued laminated structural members or of composite members of plywood and dimension lumber.

**856.2 Structural glued laminated timber members:** Stress rated fabricated units of suitably selected and prepared wood laminations not exceeding two (2) inches in net thickness, which may be comprised of pieces joined end to end or of pieces placed or glued edge to edge, securely bonded together with adhesives so that the grain of all laminations is approximately parallel longitudinally shall be designed and manufactured under controlled material procedure to meet the requirements of timber construction standards listed in Appendices B and C.

**856.3 Glued laminated members and plywood components:** Built up beam and column sections consisting of one (1) or more webs with glued lumber flanges and stiffeners shall be designed in accordance with accepted engineering analysis. Plywood components consisting of plywood alone or plywood in combination with sawn or glued laminated lumber and bonded together with adhesives shall be designed, fabricated and identified in accordance with the applicable standards listed in Appendices B and C.

**856.3.1 Gluing surfaces:** In glued lumber constructions, the surfaces to be glued shall be worked to a smooth, flat surface without sanding and free from wax, grease or oil to insure a complete glue bond over the entire contact. Factory sanded plywood shall not be prohibited.



## **ARTICLE 8—Part C**

### **BUILDING ENCLOSURES, WALLS AND WALL THICKNESS**

#### **SECTION 857.0 ENCLOSURE WALLS**

**857.1 General:** All buildings, except as may be provided for miscellaneous structures designed for special uses, shall be enclosed on all sides with independent or party walls of frame, masonry or other approved construction. Such walls shall be constructed to afford the fireresistance rating specified in Table 214 and as required in this code for location, use and type of construction.

**857.2 Projections:** Exterior enclosure walls shall be constructed entirely within property lines or building lines when established by law, except for authorized projections beyond the street lot line in accordance with the provisions of Section 309.0.

**857.3 Exterior wall pockets:** In exterior walls of all buildings and structures, wall pockets or crevices in which moisture may accumulate shall be avoided or protected with adequate caps or drips, or other approved means shall be provided to prevent water damage.

**857.4 Exceptions:** The provisions of this article shall not be deemed to prohibit the omission of exterior walls for all or part of a story of a building in accordance with the provisions of Section 906.2.

#### **857.5 Glass in walls**

**857.5.1 Labeling:** Each light of glass shall be labeled with a removable paper label showing type, thickness and manufacturer. To qualify as glass with special performance characteristics, each unit of laminated, heat strengthened, fully tempered, and insulating glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed. Heat strengthened and tempered spandrel glasses are exempted from perma-

ment labeling. This type of glass shall be labeled with a removable paper label by the manufacturer.

**857.5.2 Glass supports:** Where one (1) or more sides of any light of glass is not firmly supported, or is subjected to unusual load conditions, detailed shop drawings, specifications and analysis or test data assuring safe performance for the specific installation shall be prepared by engineers experienced in this work and approved by the building official. Analysis shall be based on the wind loads specified in Section 713.4 for secondary framing members. The elevation of the glazed opening shall be computed by adding the distances from grade to the head and sill, respectively, and dividing the sum by two (2).

**857.5.3 Glass dimensional tolerance:** Glass thickness tolerances shall comply with those established in the Table 857. Where thickness is to be controlled, nominal values are stated subject to the tolerances shown in the following Table 857.

Table 857  
MINIMUM GLASS THICKNESS

Nominal thickness	Plate glass min. thickness (inches)	Sheet glass min. thickness (inches)
SS	....	0.085
DS	....	0.115
$\frac{1}{8}$	0.094	....
$\frac{3}{16}$	0.156	0.182
$\frac{13}{64}$	0.172	....
$\frac{7}{32}$	....	0.205
$\frac{1}{4}$	0.218	0.236
$\frac{5}{16}$	0.281	....
$\frac{3}{8}$	0.343	0.357
$\frac{1}{2}$	0.468	0.478
$\frac{5}{8}$	0.562	....
$\frac{3}{4}$	0.689	....
$\frac{7}{8}$	0.750	....
1	0.875	....
$1\frac{1}{4}$	1.125	....

**857.5.4 Wind loads:** Glass exposed to wind pressure shall be capable of withstanding the design criteria of Section 713.4 for secondary framing members but shall in no case be less than the thickness prescribed in Table 857.5.4.2. The wind load used to enter Table 857.5.4.2 shall be modified by dividing the load prescribed in Section 713.4 by the value shown in Table 857.5.4.1 for the type of glass involved.



**Table 857.5.4.1**  
**RELATIVE RESISTANCE TO WIND LOAD**  
 (Assuming equal thickness)

Glass type	Approximate relationship*
Laminated	0.6
Wired glass	0.5
Heat strengthened	2.0
Fully-tempered	4.0
Factory fabricated double glazing**	1.5
Rough-rolled plate	1.0
Sandblasted	0.4
Regular plate or sheet	1.0

\*Before using Table 857.5.4.2 divide the design wind load from Section 713.0 by the value shown here for the glass type involved.

\*\*Use thickness of the thinner of the two lights, not thickness of unit.

**857.5.5 Jalousies:** In jalousie windows and doors regular plate, float sheet or rolled glass thickness shall be not less than three-sixteenths (3/16) inch; glass length shall be not more than forty-eight (48) inches; glass edges shall be smooth. Other types of glass may be used if detailed shop drawings, specifications and analysis by methods described in Section 857.5.2 or test data assuring safe performance for the specific installation are prepared by engineers experienced in this work and approved by the building official.

**857.5.6 Human impact loads:** The provisions of this code shall not be construed to establish safety standards or requirements for architectural glazing materials related to human impact hazards which vary or modify the Safety Standard for Architectural Glazing Materials listed in Appendix B.

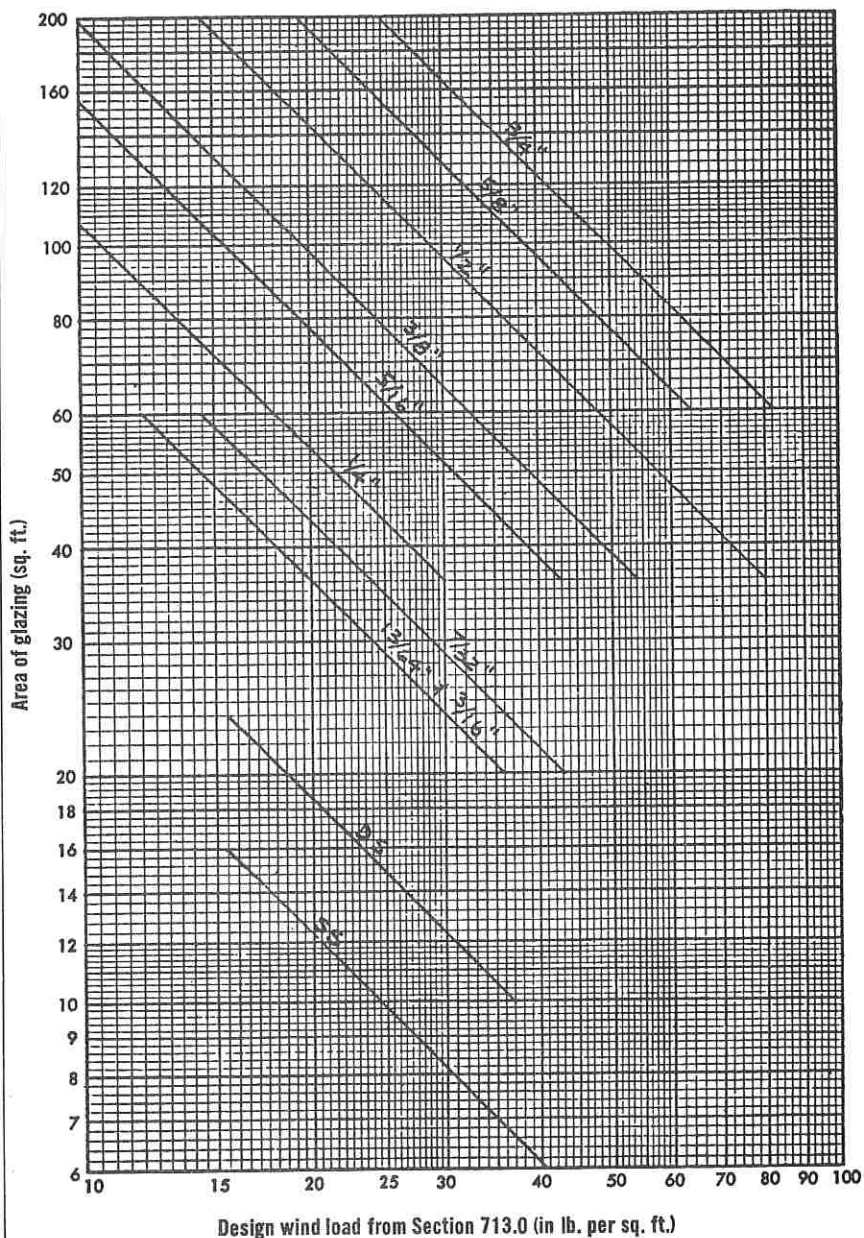
## **SECTION 858.0 PROTECTION OF WALL OPENINGS**

**858.1 Fire-protected openings:** Openings in exterior walls when required to be fire-protected shall comply with the provisions of Article 9.

**858.2 Area of openings:** All openings facing on a street, yard, court, or public space which are required for light and ventilation shall comply with the provisions of Article 5.

Table 857.5.4.2

REQUIRED NOMINAL THICKNESS OF REGULAR PLATE OR SHEET GLASS  
(Based on minimum thicknesses allowed in Federal Specifications DD-G-451b)  
Design Factor = 2.5



### 858.3 Structural strength

**858.3.1 Against wind forces:** In all buildings required to resist wind pressure under the provisions of Article 7, exterior window openings shall be designed to resist the specified wind load when such protectives are more than one hundred (100) square feet in area in the first story or more than fifty (50) square feet in area in the upper stories.

**858.3.2 Sash or frames:** The glass, or other approved glazing material shall be of adequate thickness or shall be provided with steel frames or otherwise reinforced to resist the wind loads specified in Article 7 blowing both inwardly and outwardly.

## SECTION 859.0 FIRE ACCESS PANELS

**859.1 Required:** Completely enclosed buildings, without exterior openings in the enclosure walls, or without ready access for the purpose of fighting fire, shall be provided with access panels as required herein.

**859.2 Multi-story buildings:** In all exterior walls of the building required to have thirty (30) foot wide open space adjacent thereto (see Sections 305.2 and 306.2), each floor below the thirteenth (13th) floor shall be provided with access panels as follows:

1. if such access panels are not less than thirty-two (32) inches by forty-eight (48) inches in size, they shall be spaced not more than one hundred (100) feet apart in each story; or
2. if such access panels are not less than twenty-two (22) inches by forty-two (42) inches in size, they shall be spaced not more than thirty (30) feet apart in each story.

**859.3 Single-story buildings:** In one (1) story buildings, not more than eighty-five (85) feet in height:

1. roof vents shall be provided, spaced not more than one hundred twenty-five (125) feet apart; and
2. grade level doors, or fire access panels shall be provided spaced not more than one hundred twenty-five (125) feet apart in all exterior walls of the building required to have thirty (30) foot wide open space adjacent thereto (see Sections 305.2 and 306.2)

**859.4 Construction of access panels:** Access panels shall have a sill height of not more than thirty-six (36) inches; shall be readily identifiable from the outside; and shall be readily openable from the outside, or shall be glazed with plain flat glass. When required to be fireresistance rated,

access panels shall be equipped with approved opening protectives, complying with Article 9, which are readily openable from both the outside and inside. Access panels shall be not less than thirty-two (32) inches by forty-eight (48) inches in size, except in buildings of moderate fire hazard such as schools and offices, wherein the sizes may be reduced to a minimum of twenty-two (22) inches by forty-two (42) inches.

## SECTION 860.0 STRUCTURAL GLASS BLOCK WALLS

**860.1 Exterior wall panels:** The maximum dimensions of glass block wall panels in exterior walls, when used singly or in multiples forming continuous bands of structural glass blocks between structural supports, shall be twenty-five (25) feet in length and twenty (20) feet in height between structural supports and expansion joints; and the area of each individual panel shall be not more than two hundred and fifty (250) square feet. Intermediate structural supports shall be provided to support the dead load of the wall and all other superimposed loads. When individual panels are more than one hundred and forty-four (144) square feet in area, a supplementary stiffener shall be provided behind the panels, anchored thereto and to the structural supports.

**860.2 Joint materials:** Glass blocks shall be laid up in Type S or N mortar with approved galvanized or other noncorrosive metal wall ties in the horizontal mortar joints of exterior panels. The sills of glass block panels shall be coated with approved asphaltic emulsion, or other elastic waterproofing material, previous to laying the first mortar course, and the perimeter of the panels shall be calked to a depth of not less than one-half ( $\frac{1}{2}$ ) inch with non-hardening caulking compound on both faces; or other approved expansion joints shall be provided. When laid up in joint materials other than mortars herein defined, a single panel shall not be more than one hundred (100) square feet in area nor more than ten (10) feet in either length or height.

**860.3 Wind and earthquake loads:** Exterior wall panels shall be held in place in the wall opening to resist both the internal and external pressures due to wind and earthquake loads specified in Sections 712.0, 713.0 and 716.0.

**860.4 Interior wall panels:** Structural glass blocks shall not be used in fire walls or party walls or for load-bearing construction. Such blocks shall be erected with mortar in metal frames or reinforcement as provided in this section for exterior walls or other approved joint materials, except that wood strip framing may be used in partitions not required to be fireresistance rated.

**860.5 Fireresistance rating:** Nothing herein contained shall be construed to prohibit the use of glass blocks in an opening protective assembly

or non-bearing partition or wall when required to afford a specific fire-resistance rating, provided approval of the building official is secured after satisfactory time-temperature performance under the prescribed test procedure of Article 9.

**860.6 Access panels:** Access panels shall be provided in exterior glass block walls for fire department use to comply with Section 859.0.

## SECTION 861.0 WALL FACINGS AND VENEERS

**861.1 Backing surfaces for veneers:** Veneers for other than frame buildings, shall be attached only to substantial, rigid, noncombustible surfaces which are plumb, straight and of true plane; and wood backing surfaces shall not be used, except in frame construction. The backing shall provide sufficient rigidity, stability and weather resistance; and the veneer shall be installed and anchored as required in this code for the specific material.

**861.2 Veneer thickness:** Materials used for non-bearing veneers on masonry walls shall not have less than the thickness indicated in Table 861.

**861.2.1 Nonstructural:** Masonry or other approved noncombustible materials used as facing on bearing walls or partitions shall not be considered to have structural value and shall be excluded in the determination of required wall thickness.

Table 861

MINIMUM THICKNESS OF NONBEARING VENEERS ON MASONRY WALLS

Ceramic veneer (architectural terra cotta, anchored type)	1 inch
Brick	2 inches
Stone (natural)	2 inches
Stone (cast artificial)	1½ inches
Clay tile (structural)	1¾ inches
Clay tile (flat slab)	¾ to 1 inch
Marble slabs	1 inch
Precast stone facing	5⁄8 inch
Structural glass	11⁄32 inch
Aluminum clapboard siding	.024 inch
Metal (approved corrosion-resistive)	No. 28 Galvanized Sheet Gage (0.019 in)

## SECTION 862.0 STRUCTURAL GLASS VENEERS

**862.1 Dimensions:** The minimum thickness of glass veneer shall be eleven thirty-seconds ( $1\frac{1}{32}$ ) inch and the area of individual panels shall not exceed ten (10) square feet, with a maximum length of four (4) feet. The edge of each unit shall be ground square with a slight arris; and all exposed, external corners and angles shall be rounded to a radius of not more than three-sixteenths ( $\frac{3}{16}$ ) inch.

## 862.2 Construction

**862.2.1 Backing surface:** The glass veneer shall be set in mastic cement on a float coat of one (1) inch thick cement mortar reinforced with wire lath attached to noncombustible furring spaced not more than twelve (12) inches on centers.

**862.2.2 Support of veneer:** The base course of glass units shall be supported on a corrosion-resistive metal frame anchored to the backing and calked with a waterproof compound at grade.

**862.3 Reinforcement:** Metal reinforcing of cold formed corrosion-resistive angles of not less than No. 16 Galvanized Sheet Gage (0.064 in.), or other approved reinforcement shall be provided in all horizontal joints anchored into the masonry wall with expansion or toggle bolts.

**862.4 Expansion joints:** Expansion joints shall be provided at ends and intermediate sections calked with an approved waterproofing compound as required by the approved rules. Where necessary for water-tightness, exposed edges shall be protected with corrosion-resistive metal or other approved noncombustible flashing.

**862.5 Other loads:** Signs, awning brackets or other loads shall not be hung directly from glass veneers, but shall be supported on framing anchored to or otherwise supported by the masonry wall, free from contact with the glass.

## SECTION 863.0 THIN STONE AND TILE VENEERS

**863.1 Size of units:** In localities subject to frost and freezing temperatures, tile and terra cotta units shall be frost-proof and shall not be more than two hundred and eighty-eight (288) square inches in area; and where not subject to frost action, the size of the tile may be increased not more than fifty (50) per cent in area.

**863.2 Construction:** One (1) inch thick marble, granite, terra cotta, and similar materials; or ceramic tile facing one-quarter ( $\frac{1}{4}$ ) to one (1) inch in thickness shall be set in accordance with the applicable standards listed in Appendix B.

## SECTION 864.0 METAL VENEERS

**864.1 Materials:** Veneers of metal shall be fabricated from approved corrosion-resistive alloys, or shall be covered front and back with approved porcelain enamel, or otherwise treated to render the metal resistant to corrosion.

**864.2 Construction:** The metal veneer shall be securely attached to the masonry or supported on approved metal framing protected by painting, galvanizing or other approved protection, or on wood studs and furring strips, treated with an approved preservative process.

**864.3 Waterproofing:** All joints and edges exposed to the weather shall be calked with approved durable waterproofing material or by other approved means to prevent penetration of moisture.

**864.4 Grounding metal veneers:** Grounding of metal veneers on all buildings shall comply with the requirements of Article 15 and the National Electrical Code.

### SECTION 865.0 PLASTIC VENEERS

**865.1 General:** Veneers of weather-resisting plastics shall comply with the definition of approved plastics in Section 1900.2.1 and shall be erected and anchored on a foundation coat, waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating in accordance with the approved rules.

**865.2 Height limitation:** Plastic veneer shall not be attached to any exterior wall to a height greater than thirty-five (35) feet above grade. Within the fire limits as provided in Section 301.0 exterior veneer shall be limited to the first story.

**865.3 Area limitation:** Sections of plastic veneer shall not exceed two hundred (200) square feet in area. Outside the fire limits the area may be increased by fifty (50) percent.

**865.4 Separation:** Sections of plastic veneer shall be separated by a minimum of four (4) feet vertically.

### SECTION 866.0 THICKNESS OF SOLID MASONRY WALLS

**866.1 General:** All masonry walls shall be of the minimum thickness specified in the Building Code Requirements for Masonry listed in Appendix B. The combined stress due to all loads shall not exceed the allowable working stresses specified in this code for the materials of construction.

### SECTION 867.0 THICKNESS OF PANEL WALLS

**867.1 Solid panel walls:** Panel, apron or spandrel walls as defined in this code supported at vertical intervals not exceeding thirteen (13) feet in height, shall not be limited in thickness, provided they meet the fireresistance rating requirements of Article 9 and Table 214, and are constructed of approved noncombustible weather-resisting materials of adequate strength to resist the wind loads specified in Sections 712.0 and 713.0.



**867.2 Hollow panel walls:** Unless constructed of the materials and thickness specified by the accepted engineering standards for masonry, hollow panel walls shall be tested and approved in the assembled unit as constructed in normal practice to develop the required fireresistance ratings specified in Table 214 for exposure on both faces.

**867.3 Weather resistance:** When the construction as tested and approved for a fireresistance rating does not possess the required weather resistance, it shall be covered on the exterior with approved corrosion-resistive metal facings or other approved noncombustible weather-resisting veneers.

**867.4 Anchorage:** All panel walls shall be anchored to the structural frame to insure adequate lateral support and resistance to wind and to earthquake forces where subject to seismic disturbances.

## SECTION 868.0 PARAPET WALLS

**868.1 Required:** Exterior walls required to have a fireresistance rating of one (1) hour or more shall be constructed with parapet walls having the same fireresistance rating as the wall upon which they are erected. The height of the parapet shall not be less than thirty (30) inches above the point where the roof surface and the wall intersect.

**868.2 Not required:** Parapets are not required on:

1. exterior walls and fire walls connecting with roofs of fireproof construction (Type 1A and 1B);
2. an exterior wall of a building, the roof of which is at least three (3) feet lower than the roof of, or any opening in, an adjacent building;
3. exterior walls facing on an unoccupied open space having a width of thirty (30) feet or more;
4. exterior walls of one- and two-family dwellings (use group R-3) or buildings not exceeding one thousand (1,000) square feet in area;
5. exterior walls of a building where the roof has an angle of more than twenty (20) degrees with horizontal; and
6. exterior walls connecting with roofs of noncombustible construction when the exterior wall is carried up tightly against the underside of the roof deck.

**868.3 Construction:** Parapets shall be properly coped and flashed with noncombustible, weatherproof material. All corners of masonry parapet walls shall be reinforced with at least one (1) one-quarter ( $\frac{1}{4}$ ) inch bar in



every third joint, continuous around the corner and extending into the masonry at least three (3) feet from the corner.

## SECTION 869.0 FOUNDATION WALLS

**869.1 Design:** Foundation walls shall be designed to resist frost action and to support safely all vertical and lateral loads as provided in Article 7. The maximum stresses due to combined load shall be within the values specified for the materials used in the construction. Unless properly reinforced, tensile stresses shall not exceed those permitted in plain masonry.

**869.2 Minimum thickness:** The thickness of foundation walls shall be not less than the thickness of the wall supported and the minimum thickness shall be limited for the various materials of construction as herein specified. Eight (8) inch foundation walls shall be permitted under brick-veneered frame and under ten (10) inch cavity walls when the total height of the wall supported, including gables, is not more than twenty (20) feet.

**869.2.1 Reinforced concrete:** When reinforced concrete is required to resist all stresses, foundation walls shall be not less than eight (8) inches thick.

**869.2.2 Hollow and solid masonry and mass concrete:** The thickness of masonry foundation walls shall not be less than shown in Table 869 for the type of foundation and superstructure construction used. The combined height of an eight (8) inch foundation wall and the wall supported shall not exceed thirty-five (35) feet.

Table 869  
THICKNESS OF FOUNDATION WALLS

Foundation wall construction		Maximum depth below grade (feet) <sup>1,2</sup> Supported wall construction		
Type	Thickness (inches)	Frame	Masonry vener	Masonry
Hollow masonry	8	4 (6)	4.5 (6)	5 (7)
	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Solid masonry	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Mass concrete	8	7	7	7

**Note 1.** Depth below grade may be increased up to that indicated in parentheses where such increased is warranted by soil conditions and local experience and is approved by the building official.

**Note 2.** Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds seven (7) feet, foundation wall thickness shall be determined by structural analysis as required in Section 870.2.

**869.2.3 Hollow unit walls:** Foundation walls of approved hollow masonry units shall be provided with not less than four (4) inches of solid masonry at girder bearings or shall be strengthened with buttresses.

**869.2.4 Rubble stone:** Foundation walls of rough or random rubble stone shall be not less than sixteen (16) inches thick.

**869.2.5 Bonding:** All foundation walls shall be bonded as required for superstructure walls in Section 835.0.

**869.3 Increased thickness with depth:** When any foundation wall, other than a wall that is designed as a retaining wall, extends more than twelve (12) feet below the top of the first floor beams, the thickness of the wall shall be increased four (4) inches for each additional twelve (12) feet or fraction thereof in depth.

**869.4 Corbels on eight inch walls:** Where an eight (8) inch wall is corbeled, the top corbel course shall be a full header course of headers at least six (6) inches in length, extending not higher than the bottom of the floor framing. The maximum projection of one (1) unit shall neither exceed one-half ( $\frac{1}{2}$ ) the depth of the unit nor one-third ( $\frac{1}{3}$ ) its width at right angles to the face which is offset.

**869.5 Lateral stability:** Foundation walls of buildings and structures which serve as retaining walls shall conform to the applicable requirements of Section 870.0 or shall be strengthened with buttresses or additional wall thickness to resist lateral soil and hydrostatic pressure when subjected thereto.

## SECTION 870.0 RETAINING WALLS

**870.1 General:** Walls built to retain or support the lateral pressure of earth or water or other superimposed loads shall be designed and constructed of approved masonry, reinforced concrete, steel sheet piling or other approved materials within the allowable stresses of accepted engineering practice (see Section 874.5).

**870.2 Design:** Retaining walls shall be designed to resist the pressure of the retained material, including both dead and live load surcharges to which they may be subjected, and to insure stability against overturning, sliding, excessive foundation pressure and water uplift.

**870.3 Hydrostatic pressure:** Unless drainage is provided, the hydrostatic head of water pressure shall be assumed equal to the height of the wall.

**870.4 Coping:** All masonry retaining walls other than reinforced concrete walls shall be protected with an approved coping.

**870.5 Guard rails:** Retaining walls with a difference in grade level on each side of the wall in excess of four (4) feet shall be provided with a forty-two (42) inch high guard rail or other approved protective measure.

**SECTION 871.0 ISOLATED PIERS**

**871.1 General:** Isolated masonry piers shall be bonded as required for solid walls of the same thickness and shall be provided with adequate means for distributing the load on the top of the pier.

**SECTION 872.0 WATERPROOFING AND FLOODPROOFING**

**872.1 General:** The exterior structural elements of all buildings herein specified shall be waterproofed in accordance with the approved rules.

**872.2 Steel frame:** Exterior steel columns and girders, before embedment in masonry of the required fireresistance rating specified in Table 214, shall be protected from moisture by approved waterproofing material, a parging coat of cement mortar or by a minimum of eight (8) inches of weather-tight masonry.

**872.3 Chases:** The backs and sides of all chases in exterior walls with less than eight (8) inches of approved masonry to the exterior surface shall be insulated and waterproofed.

**872.4 Foundations:** Exterior walls below grade and the cellar floors of all buildings for institutional and residential uses (use groups I and R) enclosing habitable or occupiable rooms or spaces below grade shall be made watertight, and when necessary shall be reinforced to withstand water pressure as prescribed in Sections 709.0 and 870.0. The basement walls of buildings in the residential use groups and the walls of all habitable and occupiable rooms and spaces below grade shall be protected with not less than a one (1) coat application of approved waterproofing paint, or a one-half ( $\frac{1}{2}$ ) inch parging coat of portland cement mortar or other approved dampproof covering.

**872.4.1 Subsoil drains:** Subsoil drains shall be provided around foundations enclosing habitable or usable spaces located below grade and which are subjected to ground water conditions. Drains shall be installed at or below the area to be protected and shall discharge by gravity or by mechanical means into an approved drainage system complying with the plumbing code listed in Appendix B.

**872.5 Types of waterproofing:** The processes and methods used to render buildings, structures or parts thereof watertight as herein required shall comply with accepted engineering practice covering types of waterproofing.

**872.6 Floodproofing:** Where a structure is located within a flood plain as determined by the building official or the governmental body having jurisdiction, such a structure must be designed to resist or overcome the anticipated flood conditions.

**SECTION 873.0 RATPROOFING**

**873.1 General:** All buildings and structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work; or in which feed, food or foodstuffs are stored, prepared, processed, served or sold shall be constructed rat and vermin-proof in accordance with the provisions of this section.

**873.2 Grade protection**

**873.2.1 Apron:** When required for protection against rodents, all exterior walls at and near grade shall be constructed or assembled of component materials, or chemically or otherwise treated to render the construction rat or vermin-proof. When not provided with a continuous masonry foundation wall, a masonry or reinforced concrete apron, not less than four (4) inches in thickness or of other approved nondecayable, water-resisting and rat-proofing material of required strength, shall be installed around the entire perimeter of the building.

**873.2.2 Height of apron:** The apron shall extend sufficiently above grade to provide for the average snow fall in the locality, but not less than eight (8) inches above, nor less than twenty-four (24) inches below grade level; and, if serving as a foundation bearing wall, to sufficiently greater depth to assure protection from frost action as required in Section 724.0. When the superstructure walls are not constructed of masonry, the spaces between studs shall be filled to a height of two (2) feet above grade with concrete or other material indestructible by rats.

**873.3 Grade floors:** Where continuous concrete grade floor slabs are provided, open spaces shall not be left between slab and walls, and all openings in the slab shall be protected.

**873.4 Opening protection**

**873.4.1 Wall openings:** Openings in the apron required for ventilation or other purposes shall be guarded with corrosion-resistive rodent-proof shields of not less than No. 22 Galvanized Sheet Gage (0.034 in.) perforated steel sheets, or No. 20 B & S gage aluminum or No. 16 Galvanized Sheet Gage (0.064 in.) expanded metal or wire mesh screens, with not more than one-half ( $\frac{1}{2}$ ) inch mesh openings.

**873.4.2 Slab openings:** Access openings in grade floor slabs shall be protected with concrete, masonry, metal or other corrosion-resistive non-combustible covers of adequate strength to support the floor loads.

**873.4.3 Pipes and conduits:** All openings for pipe, conduit, cable and similar purposes at or near grade shall have snugly-fitted collars to eliminate all open spaces.

**SECTION 874.0 PROTECTION AGAINST DECAY AND TERMITES**

**874.1 Approval:** The term "approval" as used in the following statements means approval in accordance with the procedure established by this code.

**874.2 Where conditions are favorable to decay**

**874.2.1 Wood in contact with the ground:** All wood in contact with the ground and supporting permanent structures shall be approved treated wood.

**874.2.2 Untreated wood:** Untreated wood may be used where entirely below ground water level or continuously submerged in fresh water; and may be used in contact with the ground for detached accessory buildings not intended for human occupancy, for temporary structures and for fences.

**874.3 Wood joists or the bottom of wood structural floors:** When wood joists or the bottom of wood structural floors without joists are closer than eighteen (18) inches, or wood girders are closer than twelve (12) inches, to exposed ground located within the periphery of the building over crawl spaces or unexcavated areas, they shall be approved durable or treated wood. Ventilation shall be provided as required in Section 507.0.

**874.4 Sills:** All sills which rest on concrete or masonry exterior walls and are less than eight (8) inches from exposed earth shall be of approved durable or treated wood.

**874.4.1 Sleepers and sills:** Sleepers and sills on a concrete or masonry slab which is in direct contact with earth shall be of approved durable or treated wood.

**874.4.2 Posts or columns:** Posts or columns in cellars shall be supported by piers projecting at least two (2) inches above the finish floor and separated therefrom by an approved impervious barrier except when approved durable or treated wood is used. Posts or columns used in damp locations below grade shall be of approved durable or treated wood.

**874.4.3 Wall pockets:** Ends of wood girders entering masonry or concrete walls shall be provided with a one-half ( $\frac{1}{2}$ ) inch air space on top, sides and end, unless approved durable or treated wood is used.

**874.4.4 Clearance between wood siding:** Clearance between wood siding and earth on the exterior of a building shall be not less than six (6) inches.

**874.5 Wood used in a retaining wall:** Wood used in a retaining wall shall be approved durable or treated wood, except as follows:

1. when the wall is not more than two (2) feet in height and is located on the property line; or
2. when the wall is not more than four (4) feet in height and is separated from the property line by a minimum distance equal to the height of the wall.

A retaining wall of durable wood shall not exceed six (6) feet in height. A wood retaining wall shall be separated from any permanent building by a minimum distance equal to the height of the wall.

**874.6 Where approved durable or treated woods are required:** Where approved durable or treated woods are required in this code, the building official may require identification by an approved mark or certificate of inspection. All lumber and plywood required to be preservatively treated shall bear an approved quality mark of an inspection agency that maintains continuing control, testing and inspection over the quality of the product as described in the quality control standards listed in Appendix C.

**874.7 Pressure treatment:** Where pressure treatment of wood members is required by this code, preservatives and methods of treatment shall conform to the standards for pressure treatment and preserving of lumber listed in Appendix C.

**874.7.1 Geographical areas:** In those geographical areas where experience has demonstrated a need for greater protection, the requirements in the preceding items may be modified to the extent required by local conditions.

## **SECTION 875.0 FIRE PROTECTION AND FIRESTOPPING**

**875.1 General:** To prevent the free passage of flame through concealed spaces or openings in event of fire, provision shall be made to trim all combustible framing away from sources of heat, to provide effective fire barriers against the spread of fire between all subdivisions and all stories of the building, to provide adequate fire separation against exterior exposure, and to firestop all vertical and horizontal draft openings as specified herein or in Section 919.2.

**875.2 Beam separation in ordinary construction (Types 3B and 3C):** All wood and other combustible floor, roof and other structural members framing into masonry walls shall be cut to a bevel of three (3) inches in the depth and shall project not more than four (4) inches into the wall; and the distance between embedded ends of adjacent beams or joists entering into the wall from opposite sides shall be not less than four (4) inches.

**875.3 Girder separation in heavy timber construction (Type 3A):** Wood girders framing into walls shall have at least eight (8) inches of masonry between their ends and the outside face of walls and at least eight (8) inches of masonry between adjacent beams entering the wall from opposite sides. The girders shall be fire-cut, supported in pockets or in self-releasing metal boxes, or otherwise supported to minimize destruction of the wall in the event of fire.

**875.4 Flues and chimneys:** Combustible framing shall be trimmed not less than two (2) inches away from all flues, chimneys and fireplaces, and six (6) inches away from flue openings.

**875.5 Fireplaces:** Hearths of noncombustible construction and fireboards, mantels and other combustible trim shall comply with Section 1007.0 governing fireplace construction.

**875.6 Concealed roof spaces:** Concealed roof spaces of all buildings, except where the roof and attic are of noncombustible or fireproof construction, shall be subdivided into areas not exceeding three thousand (3,000) square feet by means of approved fire stops. When doors or other openings are provided in such subdividing partitions, they shall be of noncombustible or similarly protected materials and the construction shall be tightly fitted around all ducts or other assemblies piercing such partitions.

**875.6.1 Automatic fire suppression system:** Attic spaces, equipped with an approved automatic fire suppression system throughout, may be subdivided into areas not exceeding nine thousand (9,000) square feet by means of approved fire stops in compliance with this section.

**875.7 Architectural trim:** Exterior cornices and other exterior architectural elements, where permitted of combustible construction in Section 924.0, or when erected with combustible frames, shall be firestopped at maximum intervals of twenty (20) feet. If non-continuous, they shall have closed ends, with at least four (4) inches separation between adjoining sections.

**875.8 Combustible trim and finish:** The space behind combustible trim and finish where permitted under this code and all other hollow spaces where permitted in fireresistance rated construction shall be back-filled with noncombustible materials or firestopped as required in Section 920.0.

**875.9 Firestopping:** Firestopping meeting the requirements of Section 919.0 shall be provided in stud walls and partitions and in all furred or studded off spaces of masonry walls at each floor level; between the ceiling of the top story and roof space and at maximum intervals of eight (8) feet in all such spaces; at the top and bottom and at least once in the middle of each run of stairs; in concealed wall pockets for sliding doors; at openings for pipes, belts, shafting, chutes and conveyors passing through combustible floors or partitions with close-fitting noncombustible caps or metal shutters or other approved noncombustible means; and in all other locations that would permit the free travel of flame.

## SECTION 876.0 THERMAL INSULATING MATERIALS

**876.1 General:** Insulating batts, blankets, fills or similar types of materials, including vapor barriers and breather papers or other coverings



which are a part of the insulation, incorporated in construction elements shall be installed and used in a manner that will not increase the fire hazard characteristics of the building or any part thereof.

**876.2 Installation in Type 1 and Type 2 construction:** Such materials when exposed as installed in buildings of fireproof or non-combustible (Types 1 or 2) construction shall comply with the requirements of Section 904.2 for Class I materials.

**876.3 Installation in Type 3 and Type 4 construction:** Such materials, when exposed as installed in attic spaces in buildings of ordinary or frame (Types 3 and 4) construction shall comply with the requirements of Section 904.2 for Class III materials.

**876.4 Facings and coverings:** Vapor barriers, breather papers or other coverings of insulating materials, when installed adjacent to or not more than one and one-half (1½) inches from the unexposed surface of ceiling or sidewall interior finish, or when installed in completely enclosed wall, ceiling joist or rafter spaces and firestopped as required in Section 875.0, are not required to have a flame resistance rating.

**876.5 Foam plastics:** Foam plastics shall have a smoke developed rating not greater than four hundred fifty (450) when tested in accordance with ASTM E-84 listed in Appendix G.

Unless otherwise specifically approved, based on accepted diversified tests such as ASTM E-84, ignition temperature and full scale corner tests, the requirements listed below shall apply to all uses of foam plastics in or on walls and ceilings.

1. Foam plastics having a flame spread of seventy-five (75) or less may be used within the cavity of a masonry wall, in cores of masonry units, or within the stud space of an unprotected wood frame wall or on the inside of a building to cover the surface of a complying wall or ceiling if it is fully protected by a thermal barrier of fire-resistive materials having a finish rating of not less than fifteen (15) minutes.
2. Foam plastic insulation having a flame spread of seventy-five (75) or less when tested in a thickness of four (4) inches, may be used in thicknesses up to ten (10) inches for use in cold storage rooms, food processing rooms, ice plants and similar rooms when the room is protected with automatic sprinklers and the insulation is covered with one-half (½) inch portland cement plaster or other approved



material having a finish rating of not less than fifteen (15) minutes.

3. Foam plastic insulation having a flame spread of twenty-five (25) or less may be used in a thickness of not more than four (4) inches when the foam plastic is covered by a metal facing of No. 20 B&S Gage (0.032 inches) aluminum or No. 26 Manufacturers Standard Gage (0.0179 inches) steel or greater thicknesses of either metal and the insulated area is protected with automatic sprinklers. Such panels shall not be used where noncombustible or fireresistance rated construction is required.



## ARTICLE 9

### FIRERESISTIVE CONSTRUCTION REQUIREMENTS

#### SECTION 900.0 GENERAL

**900.1 Scope:** The provisions of this article shall govern the use and design of all materials and methods of construction in respect to required fireresistance rating and flameresistance as determined by the potential fire hazard of the use and occupancy of the building or structure and the location and function of all integral structural and other fire-protective elements of the building; and the installation of safeguards against the spread of fire to and from adjoining structures.

**900.2 Performance standards:** The requirements of this article shall constitute the minimum functional performance standards for fire-protection purposes; and shall not be deemed to decrease or waive any strength provisions or in any other manner decrease the requirements of this code in respect to structural safety.

**900.3 Use of combustibles:** All materials and forms of construction that develop the fireresistance rating required by this code shall be acceptable for fireproofing and structural purposes; except that the use of combustible component materials in structural units or structural assemblies shall be limited in types of construction specified in Sections 215.0 and 216.0 and in the following Section 900.3.1.

**900.3.1 Combustible components:** Combustible aggregates may be incorporated in concrete mixtures approved for fireresistance rated construction as provided in Sections 810.0 and 849.0 for gypsum concrete, in Section 844.0 for cinder concrete, and any other approved component material or admixture may be used in assemblies that meet the fireresistive test requirements of this code; and wood nailing strips or any other material of similar combustible characteristics may be embedded in concrete and masonry construction for securing trim and finish.

#### SECTION 901.0 PLANS AND SPECIFICATIONS

**901.1 General:** Plans for all buildings shall designate the type of construction and the fireresistance rating of all structural elements as required

by this code. The plans or specifications shall include documentation or supporting data substantiating all required fireresistance ratings.

## SECTION 902.0 FIRE HAZARD CLASSIFICATION

**902.1 General:** The degree of fire hazard of buildings and structures for each specific use group as defined by the fire grading in Table 902 shall determine the requirements for fire walls, fire separation walls and the segregation of mixed uses as prescribed in Section 213.0 and all structural members supporting such elements unless otherwise provided for in this code.

**902.2 Unclassified uses:** The building official shall determine the fire hazard classification of a building or structure design for a use not specifically provided in Table 902 in accordance with the fire characteristics and potential fire hazard of the use group which it most nearly resembles; or its designation shall be fixed by the approved rules.

Table 902  
FIRE GRADING OF USE GROUPS

Class	Use group	Fire grading in hours
A-1	Assembly, theatres	3
A-2	Assembly, night clubs	3
A-3	Assembly, recreation centers, lecture halls, terminals, restaurants	2
A-4	Assembly, churches, schools	1½
B	Business	2
F	Factory and industrial	3
H	High hazard	4
I-1	Institutional, restrained occupants	3
I-2	Institutional, incapacitated occupants	2
M	Mercantile	3
R-1	Residential, hotels	2
R-2	Residential, multifamily dwellings	1½
R-3	Residential, 1 and 2 family dwellings	1
S-1	Storage, moderate hazard	3
S-2	Storage, low hazard	2

## SECTION 903.0 FIRERESISTANCE TESTS

**903.1 Structural building assemblies:** Built-up masonry units and composite assemblies of structural materials including walls, partitions, columns, girders, beams and slabs and assemblies of slabs and beams or other combinations of structural units for use in floor and roof construction shall be regulated by the fireresistance ratings of Table 214. The fireresistance rating of the floor and ceiling assemblies shall extend to and be tight against the exterior wall.

**903.2 Column, beam and girder protection**

**903.2.1 Tests without load:** To evaluate column, beam and girder protection for structural units when the fireproofing is not a structural part of the element, in lieu of full size tests of loaded specimens, the structural sections encased in the material proposed for use as insulation and fire protection may be subjected to the standard test procedure without load.

**903.2.2 Alternate protection:** When it can be shown to the building official that the structural integrity of structural framing elements will not be reduced below a safe level by a fire, within the building or in an adjacent building, having a severity corresponding to the fireresistance rating required for the elements, through the use of heat shields, separations or other approved means of protection, fire protective coverings or insulating enclosing materials need not be provided for such elements.

### **903.3 Roof coverings**

**903.3.1 Test procedure and classification:** Roof covering materials shall be classified in accordance with the severity of exposure to exterior fire and ability to resist the spread of fire from surrounding buildings and structures when tested in accordance with the roof covering standard listed in Appendix G.

**903.3.2 Class A roofings:** Are those which are effective against severe fire exposure. In addition to roof coverings which have been classified, asbestos cement, metal, portland cement concrete, slate, concrete masonry and tile are acceptable where Class A roof coverings are required.

**903.3.3 Class B roofings:** Are those which are effective against moderate fire exposure.

**903.3.4 Class C roofings:** Are those which are effective against light fire exposure.

**903.3.5 Non-classified roofings:** Are those not tested.

### **903.4 Opening protectives**

**903.4.1 Fire assembly:** Shall include the fire doors, fire window, or fire damper and all required hardware, anchorage, frames and sills necessary for the assembly.

**903.4.2 Labeled fire doors:** Opening protective assemblies including the frames, hardware and operation which comply with the standards listed in Appendix G and accepted practice, including shop inspection, of an accredited authoritative testing or inspection agency shall be deemed to meet the requirements of this code for their recommended and approved locations and use as listed in Section 915.0.

**903.4.3 Door openings more than 120 square feet:** Labeled fire doors for openings which are more than one hundred and twenty (120) square feet in area may be approved as conforming to all the standard construction requirements of tested and approved fire door assemblies except as to size.

**903.4.4 Labeled fire windows and shutters:** Fire window assemblies and shutters which comply with Section 916.0, and the standards listed in Appendix G and accepted practice of an accredited authoritative testing or inspection agency shall be deemed to meet the requirements of their recommended and required locations under this code.

**903.4.5 Labeled fire dampers:** Only fire dampers which have been tested in accordance with the standards listed in Appendix G and listed by an accredited authoritative testing or inspection agency shall be deemed to meet the requirements of this code.

**903.5 Combustibility tests:** Where the behavior of materials under exposure to fire is specified in this code, the characteristics of materials shall be determined by the following tests and criteria.

**903.5.1 Tests:** The following tests shall serve as criteria for acceptance of building materials (when tested in the form and thickness in which they are used) as set forth in Sections 215.0, 216.0 and 217.0 governing the combustibility of building materials for use in Types 1, 2 and 3 construction.

1. Materials which pass the test procedure for defining noncombustibility of elementary materials set forth in ASTM E 136 listed in Appendix G when exposed to a furnace temperature of thirteen hundred eighty-two (1382) degrees F. for a period of five (5) minutes, and do not cause a fifty-four (54) degrees F. above the furnace air temperature at the beginning of the test and which do not flame after an exposure of thirty (30) seconds.
2. Materials having a structural base of noncombustible material as defined in paragraph 1 above, with a surfacing not more than one-eighth ( $\frac{1}{8}$ ) inch thick which has a flame-spread rating not greater than fifty (50) when tested in accordance with the method of test for surface burning characteristics of building materials as set forth in ASTM E 84 listed in Appendix G.

The term noncombustible does not apply to the flame spread characteristics of interior finish or trim materials. A material shall not be classed as noncombustible building construction material which is subject to increase in combustible or flame spread rating beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

### **903.6 Fire-retardant treated wood**

**903.6.1 Tests:** Where permitted for use as a structural element, fire-retardant treated wood shall be tested in accordance with the standard method of test for surface burning characteristics of building materials (tunnel test) listed in appendix G and shall show a flame spread rating not greater than twenty-five (25) when exposed for a period of not less than thirty (30)

minutes, without evidence of significant progressive combustion. The material shall bear the identification of an accredited authoritative testing or inspection agency showing the performance rating thereof.

**903.6.2 Use limitations:** Wood that has been pressure treated with fire-retardant chemicals in accordance with the standards for pressure treatment of lumber or plywood in buildings listed in Appendix G or treated by other approved means during manufacture may be used in Types 1 and 2 construction for partitions, structural elements and roof framing and sheathing as indicated by Note h in Table 214, provided that the assembly in which such material is used shall produce the required fireresistance rating when tested in accordance with the standard method of fire test for building construction and materials listed in Appendix G. Where the material is to be subjected to sustained high humidity or exposed to the weather, it shall be further identified to indicate that there is not an increase in listed fire hazard classification after being subjected to the Underwriters' Laboratories (ULI) Standard Rain Test. Where used as a structural element, such material shall meet the requirements of Section 903.6.1. Where used as interior finish, such material shall meet the requirements of Section 904.0.

## SECTION 904.0 FLAMERESISTANCE TESTS

**904.1 General:** All materials which are required to restrict the spread of flame or to be flameresistant under the provisions of this code, including, but not limited to, interior finish materials, fire-retardant treated wood, tents and tarpaulins, and interior hangings and decorations, shall meet the requirements for their respective use and classifications as determined by the applicable test procedures listed in Appendix G.

**904.2 Interior finish materials:** All materials used for interior finish shall be classified in accordance with the Method of Test for Surface Burning Characteristics of Building Materials as listed in Appendix G.

**Table 904**  
**INTERIOR FINISH CLASSIFICATION**

Class of material	Surface burning characteristics test (tunnel test)
I	0 to 25
II	26 to 75
III	76 to 200

### 904.3 Interior hangings and decorations

**904.3.1 Acceptance criteria:** Where required to be flameresistant under the provisions of this code all materials specified or required for artistic enhancement or use for decorations, draperies, curtains, scenery and hang-

ings shall comply with this section for noncombustible or fire-retardant materials or if treated to be flameresistant shall not generate smoke or gases more dense or more toxic than those given off by untreated wood or paper burning under comparable conditions when tested in the vertical flame test listed in Appendix G.

**904.3.2 Limitation of approval:** All approvals of organic decorative material shall be limited to one (1) year. The owner or his authorized agent shall file an affidavit with the building official certifying that the process and materials used comply with this code and stating the date of treatment and the warranted period of effectiveness of the process.

**904.3.3 Field test for decorative materials:** The building official shall subject decorative materials where required to be flameresistant to a field test consisting of the application of the flame from a three-quarter (¾) inch paraffin candle for a period of one (1) minute. The material shall not flash, nor support combustion, nor continue to flame for more than two (2) seconds or glow for more than thirty (30) seconds after removal of the test flame.

**904.3.4 Replacement of defective materials:** All treated hangings, draperies, canvas and other decorative and tent materials that fail to meet the field test requirements shall be retreated or replaced by an approved installation.

## SECTION 905.0 SPECIAL FIRERESISTIVE REQUIREMENTS

**905.1 General:** In buildings or parts thereof of the uses and types of construction herein specified, the general fireresistive requirements of Table 214 and the height and area limitations of Table 305 shall be subject to the exceptions and modifications described in Sections 905.2 through 905.9.

**905.2 Public garages:** All existing buildings and structures altered or converted for use to a garage, motor vehicle repair shop or gasoline service station, more than one (1) story in height, unless of fireproof (Type 1) construction, or heavy timber (Type 3A) construction, shall have the partitions, columns and girders and all floor and roof construction protected and insulated with noncombustible materials or assemblies of component materials having a fireresistance rating of not less than one (1) hour; except that existing roof trusses shall be exempt from all fireproofing requirements.

**905.3 Petroleum bulk storage buildings:** Warehouses for the bulk-storage of not more than fifty thousand (50,000) gallons of lubricating oils with a flash point of not less than three hundred (300) degrees F. in approved sealed containers may be erected outside the fire limits of masonry wall (Type 3) construction not more than five thousand (5,000) square feet in area and not more than one (1) story or twenty (20) feet in



height; or to proportionate areas in other types of construction as regulated by Table 305. Not more than one (1) motor vehicle may be stored in such buildings unless separately enclosed with a fire separation wall of two (2) hour fireresistance rating.

**905.4 Packing and shipping rooms:** Every packing or shipping room located on or below a floor occupied for use group M (mercantile) use shall be separated therefrom by fire separation walls or floor-ceiling assemblies of not less than the fireresistance rating of the type of construction but not less than one (1) hour fireresistance rating.

**905.5 Truck loading and shipping areas:** Truck loading and shipping areas shall be permitted within any use group B (Business) building, provided such areas are enclosed in construction of not less than the fireresistance rating of the type of construction as set forth in Table 214 but not less than one (1) hour, and direct access is provided therefrom to the street.

#### **905.6 Use group R (residential) buildings**

**905.6.1 Protected ordinary construction:** Multi-family dwellings (use group R-2) of protected ordinary (Type 3B) construction may be increased to six (6) stories or seventy-five (75) feet in height when the first floor construction above the basement or cellar has a fireresistance rating of not less than three (3) hours and the floor area is subdivided by two (2) hour fire walls into fire areas of not more than three thousand (3,000) square feet.

**905.6.2 Protected noncombustible construction:** When of protected noncombustible (Type 2B) construction, multi-family dwellings (use group R-2) may be increased to nine (9) stories or one hundred (100) feet in height when separated by not less than fifty (50) feet from any other building on the lot and from interior lot lines, the exitways are segregated in a fire area enclosed in a fire wall of two (2) hour fireresistance rating and the first floor construction has a fireresistance rating of not less than one and one half (1½) hours.

**905.6.3 Retail business use:** The first floor of buildings of unprotected noncombustible (Type 2C), masonry wall (Type 3C) or frame (Type 4 B) construction may be occupied for retail store use, provided the floor-ceiling assembly and enclosure walls are protected to afford one (1) hour fireresistance rating and the exitways from the residential floors are separately enclosed in accordance with the requirements of Article 6.

#### **905.7 Grade floor protection**

**905.7.1 Non-fireproof construction:** In all buildings other one- and two-family dwellings (use group R-3) and other than fireproof (Type 1) construction with habitable or occupiable stories or basements below grade, the floor-ceiling assemblies and supports below the grade floor shall be protected by one (1) of the following methods:

1. fireresistance rating of not less than one (1) hour, or
2. heavy mill (Type 3A) construction, or
3. automatic fire suppression system.

The fireresistance rating provided shall not be less than the rating required by Table 214 for type of construction.

**905.7.2 Protected noncombustible construction:** In all buildings of protected noncombustible (Type 2A) construction, more than four (4) stories or fifty (50) feet in height, in other than residential (R) use groups, the floor-ceiling assembly above the basement or cellar shall be constructed with a fireresistance rating of not less than two (2) hours.

**905.7.3 Basement assembly uses:** Places of public assembly for amusement, entertainment, instruction, or service of food or refreshment shall not be located in stories or rooms below grade unless the floor-ceiling assembly above and below is of not less than one and one-half (1½) hour fireresistance rating.

**905.8 Noncombustible construction exemptions:** One (1) story buildings of Type 2C construction which do not exceed three thousand (3,000) square feet in area in all use groups except high hazard (H), assembly (A) and institutional (I) shall be exempt from all protected exterior wall requirements.

**905.9 Interior partitions:** In buildings and structures of other than institutional (I) and residential (R) use groups of fireproof (Type 1) and protected noncombustible (Types 2A and 2B) constructions, partitions of a single thickness of wood or approved composite panels, and glass or other approved materials of similar combustible characteristics, may be used to subdivide rooms or spaces into offices, entries, or other similar compartments, provided they do not establish a corridor serving an occupant load of thirty (30) or more in areas occupied by a single tenant and not exceeding five thousand (5,000) square feet between fire separation assemblies or fire walls. An area not exceeding seventy-five hundred (7500) square feet may be subdivided with fireretardant treated wood when complying with Section 903.6.

**905.10 Plenums:** The use of uninhabited basements, cellars, crawl spaces, cavity walls, areas above ceilings or attic spaces as supply, make up, exhaust air or return air plenums or ducts is prohibited.

**Exception:** Air ceiling plenums may be installed as supply or return air plenums in all occupancies except one- and two-family dwellings, provided such air plenums meet the requirements of other applicable articles of this code and of the mechanical code listed in Appendix B and provided fuel-fired equipment or exposed combustible materials are not located therein. The use of air ceiling plenums shall be confined to one (1) fire area. The floor or roof assembly above an unlisted air ceiling plenum shall not depend upon the air ceiling for a portion of its fireresistive rating. Insulated cold water, hot water, steam, fire protec-

tion piping, building sanitary and storm drains, and vent systems may be installed in air ceiling plenums. Electrical wiring and equipment in air ceiling plenums shall conform to the requirements of the National Electrical Code listed in Appendix B. The use of air ceiling plenums in evaporative cooling systems is prohibited. Panning of the joist or stud space for return air is permitted in one- and two-family dwellings only. Crawl spaces not used as storage areas in one- and two-family dwellings may be used for air distribution systems.

**905.11 Fire dampers:** Except when proper fire tests have shown that fire dampers are not necessary to maintain the integrity of the fireresistance rated assembly, fire dampers complying with the SMACNA Fire Damper Guide, listed in Appendix B or UL 555 listed in Appendix G, shall be installed in the following locations:

1. Ducts penetrating a fire wall. (When a fire wall is of three (3) hour or greater fire endurance, a fire door is required.)
2. Ducts passing through a fire separation wall.
3. Ducts penetrating a fireresistance rated shaft wall. Sub-ducts extending twenty-two (22) inches vertically upward may be used in lieu of fire dampers for exhaust ducts.
4. Ducts penetrating the ceiling of a fireresistance rated floor/roof-ceiling assembly.
5. Ducts penetrating fireresistance rated corridor walls, unless the building is completely sprinklered or unless the ducts are part of an engineered smoke removal system.

## SECTION 906.0 EXTERIOR WALLS

**906.1 General:** All exterior walls shall comply with the structural provisions of Articles 7 and 8 and with the fireresistance rating requirements of Table 214.

**906.2 Exceptions:** The provisions of this code shall not be deemed to prohibit the omission of exterior walls for all or part of a story when required for special uses and occupancies; except that when so omitted, the open areas shall be separated from the rest of the area and from the upper and lower stories of the building by wall and floor construction of the fireresistance rating required in Table 214; and except as otherwise specifically permitted in this code, the piers, columns and other structural supports within the open portion shall be constructed with the fireresistance rating required for exterior bearing walls in Table 214.

### 906.3 Vertical separation of windows

**906.3.1 Where required:** In all buildings and structures designed for business (B), factory and industrial (F), high hazard (H), mercantile (M) or storage (S) uses, exceeding three (3) stories or forty (40) feet in height, openings located vertically above one another in exterior walls which are required to have a fireresistance rating of more than one (1) hour shall be separated by apron or spandrel walls not less than three (3)

feet in height extending between the top of any opening and the bottom of the opening next above.

**906.3.2 Fireresistance rating:** The apron or spandrel walls shall be constructed with the same fireresistance rating required for the exterior wall in which it is located as specified in Table 214; except when such required rating exceeds one (1) hour, approved wire glass construction in fixed noncombustible sash and frames not exceeding one-third ( $\frac{1}{3}$ ) of the area of such apron or spandrel may be located therein, and except further that in exterior non-bearing enclosure walls which are not required to be of more than one (1) hour fireresistance rating the provisions of this section in respect to apron or spandrel walls shall not apply.

## SECTION 907.0 FIRE WALLS AND PARTY WALLS

**907.1 General:** Walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall and shall be constructed of any approved noncombustible materials providing the required strength and fireresistance rating specified in Table 214 for the type of construction, but not less than the fire grading of the use group specified in Table 902. The construction shall comply with all the structural provisions for bearing or nonbearing walls of this code.

**907.2 Solid masonry:** When constructed of solid masonry, the wall thickness shall be not less than the requirements of Section 866.0.

**907.3 Reinforced concrete:** When constructed of reinforced concrete, the wall thickness shall be not less than nine (9) inches for the uppermost thirty-five (35) feet or portion thereof measured down from the top of the wall.

**907.4 Cutting walls:** A wall, eight (8) inches or less in thickness, shall not be cut for chases or socketed for insertion of structural members subsequent to erection (see Section 837.0).

**907.5 Hollow walls:** When combustible members frame into hollow walls or walls of hollow units, all hollow spaces shall be solidly filled for the full thickness of the wall and for a distance not less than four (4) inches above, below and between the structural members, with noncombustible materials approved for firestopping in Section 919.0. The wall shall be not less than the minimum thickness specified in the Building Code Requirements for Masonry listed in Appendix B.

**907.6 Combustible insulation:** The building official may permit the application of cork, fiberboard or other combustible insulation if laid up without intervening air spaces and attached directly to the face of the wall, and protected on the exposed surface as provided in Sections 823.0 and 876.0.

**907.7 Continuity of walls:** In all buildings and structures, walls shall be continuous from foundation to two (2) feet eight (8) inches above the roof surface, except for the following.

1. The wall may terminate at the underside of the roof deck where the roof is of noncombustible construction and is properly firestopped at the wall.
2. The wall may terminate at the underside of the roof deck in Types 3 and 4 construction if properly firestopped, and the roof sheathing or deck is constructed of approved noncombustible materials for a distance of four (4) feet on either side of the wall and combustible material does not extend through or over the wall.

**907.8 Offset fire walls:** If fire walls are offset at intermediate floor levels in fire-protected skeleton frame construction, the offset floor construction and the intermediate wall supports shall be constructed of noncombustible materials with a fireresistance rating not less than that required for the fire wall.

## SECTION 908.0 FIRE WALL OPENINGS

**908.1 General:** Openings in fire walls shall not exceed the limits in size and area herein prescribed and the opening protectives shall conform to the provisions of Sections 903.0 and 914.0.

**908.2 Size of opening:** Except in sprinklered buildings, an opening through a fire wall shall not exceed one hundred and twenty (120) square feet in area, and aggregate width of all openings at any floor level shall not exceed twenty-five (25) per cent of the length of the wall.

**908.2.1 First story exception:** When the entire areas on both sides of a fire wall are protected with an approved automatic fire suppression system complying with the requirements of Article 12, openings designed for the passage of trucks may be constructed not more than two hundred and forty (240) square feet in area with a minimum distance of three (3) feet between adjoining openings. Such openings shall be protected with approved automatic opening protectives of three (3) hour fireresistance rating and provided with an approved water curtain for such openings in addition to all other requirements.

**908.3 Opening protectives:** Every opening in a fire wall shall be protected on both sides with an approved automatic protective assembly as herein required, or the approved labeled equivalent, except horizontal exit openings.

**908.3.1 Hold-open devices:** Heat-actuated hold-open devices used on an automatic fire assembly providing three (3) hour fireresistance rating shall be installed, one (1) on each side of the wall at ceiling height where the ceiling is more than three (3) feet above the opening. Fire assemblies protecting openings required to have one and one-half (1½), one (1) or

three-fourths (¾) hour fireresistance rating, and which are not exitway doors, may be activated in a similar manner, or by a single fusible link incorporated in the closing device. Doors opening in a means of egress shall be closed by actuation of a smoke detector conforming to the standards listed in Appendix I.

## SECTION 909.0 FIRE SEPARATION WALLS

### 909.1 Uses

**909.1.1 Mixed uses:** When a building contains more than one (1) occupancy, and each part of the building is separately classified as to use, the mixed uses shall be completely separated with fire separation walls as specified in Section 213.0.

**909.1.2 One- and two-family dwellings:** The requirements for the construction of fire separation walls in buildings containing single-family dwellings or two-family dwellings (use group R-3) are as follows.

**Two-family dwelling, superimposed dwelling units:** When one (1) dwelling unit of a two-family dwelling is located wholly or partly above the other dwelling unit, the two (2) dwelling units shall be completely separated by fire separation walls and floor-ceiling assemblies of not less than one (1) hour fireresistance rated construction.

**Two-family dwelling, side-by-side dwelling units:** When adjacent dwelling units of a two-family dwelling are attached by a common wall, said wall shall be a fire separation wall, having a minimum one (1) hour fireresistance rating that shall serve to completely separate the dwelling units.

**Multiple, single-family dwellings; side-by-side:** When multiple, single-family dwellings (use group R-3) are attached by a common wall, said wall shall be a fire separation wall, having a minimum one (1) hour fireresistance rating. Said wall shall extend from the foundation to the underside of the roof sheathing, and to the inside of the exterior wall sheathing.

**Multiple, two-family dwellings; side-by-side:** When multiple, two-family dwellings (use group R-3) are attached by a common wall, said wall shall be a fire separation wall, having a minimum one (1) hour fireresistance rating. Said wall shall extend from the foundation to the underside of the roof sheathing and to the inside of the exterior wall sheathing.

**909.1.3 Exitways:** Fire separation walls required for the enclosure of exitways and areas of refuge shall be constructed of masonry, reinforced concrete or any other approved noncombustible materials having the minimum fireresistance rating prescribed by Table 214; except that such walls may be constructed of combustible materials as regulated by Sections 616.9 and 909.3.

**909.1.4 Other uses:** Fire separation walls used for subdividing purposes other than exitways and areas of refuge shall be constructed of the types of materials and have the minimum fireresistance rating as prescribed by Table 214 for the type of construction.

## **909.2 Openings**

**909.2.1 Size:** Exitway doors located in fire separation walls shall be limited to a maximum aggregate width of twenty-five (25) per cent of the length of the wall and the maximum area of any single opening shall not exceed forty-eight (48) square feet.

**909.2.2 Protectives:** All opening protectives in fire separation walls shall comply with the provisions of Section 903.0 and shall have the minimum fireresistance rating as set forth in Section 915.0.

## **909.3 Combustible stair enclosures**

**909.3.1 Construction:** Stair enclosures constructed of approved combustible assemblies protected with component materials to afford the required fireresistance ratings shall be continuous through combustible floor construction and shall provide an unbroken fire barrier in combination with protected floors, ceilings and fire doors, separating the exitways from the unprotected areas of the building. Such enclosures shall be firestopped to comply with Sections 875.9 and 919.0.

**909.3.2 Openings for lighting:** Openings for the purpose of providing light in such enclosures may be protected with wired glass with single panes not more than three hundred and sixty (360) square inches in area and a total area in one (1) story of not more than seven hundred and twenty (720) square inches. Such light panels shall comply with the provisions of Section 917.0, and shall be contained in stationary sash and frames of steel or other approved noncombustible materials.

**909.4 Continuity:** All fire separation walls shall extend from the top of the fireresistance rated floor below to the ceiling above, unless otherwise provided for in this code, and shall be securely attached thereto. Where these walls enclose required exitways, areas of refuge and shafts, or where these walls separate mixed uses, they must be continuous through all concealed spaces such as the space above a suspended ceiling, and they must be constructed tight to the underside of the floor slab or roof deck above. The supporting construction shall be protected to afford the required fireresistance rating of the wall supported. All hollow vertical spaces shall be firestopped at every floor level as required in Sections 875.0 and 919.0.

## **SECTION 910.0 VERTICAL SHAFTS**

**910.1 General:** The provisions of this section shall apply to all vertical shaft enclosures, except as provided for stairway enclosures in Sections



616.9 and 909.0, refuse chutes in Section 1107.0, and elevator and dumb-waiter hoistways in Section 1609.0.

**910.2 Open shaft enclosures:** The enclosing wall of shafts that are open to the outer air at the top shall be constructed of materials specified in Article 8 for exterior walls of buildings and structures of the required fireresistance rating specified in Table 214.

**910.3 Covered shaft enclosures:** The enclosing walls and the top of interior covered shafts shall be constructed of approved masonry, reinforced concrete or other approved construction with a fireresistance rating of not less than two (2) hours, except as provided in Section 910.4.

**910.4 Shafts in residential buildings:** In one- and two-family dwellings of other than fireproof or noncombustible construction, shafts may be supported on and constructed of combustible materials or assemblies having a fireresistance rating of not less than one (1) hour and shall extend not less than three (3) feet above the roof with a ventilating skylight of noncombustible construction as specified in Section 924.0.

**910.5 Duct and pipe shafts:** In all buildings other than one- and two-family dwellings, vertical pipes arranged in groups of two (2) or more which penetrate two (2) or more floors and occupy an area of more than one (1) square foot, and vertical ducts which penetrate two (2) or more floors, shall be enclosed by construction of not less than one (1) hour fireresistance rating to comply with this section. All combustible pipes and ducts connecting two (2) or more stories shall be enclosed as indicated herein.

#### **910.6 Top enclosure**

**910.6.1 Not extending to roof:** A shaft that does not extend into the top story of the building shall be enclosed with top construction of the same strength and fireresistance rating as the floors of the building or structure in which it occurs, but not less than that of the fireresistance rating of the shaft enclosure. Such shafts shall be provided with noncombustible vents for the relief of smoke and gases in the event of fire, with an area not less than ten (10) per cent of the shaft area.

**910.6.2 Extending to roof:** All shafts that extend to the roof of the buildings shall be covered at the top with a thermostatically controlled skylight of not less than ten (10) per cent of the area of the shaftway, constructed in accordance with the requirements of Section 925.0. The automatic operation of the skylight may be controlled by fusible links designed to operate at a fixed temperature of not more than one hundred and sixty (160) degrees F. or by electric or pneumatic operation under a rapid rise in temperature at a rate of fifteen (15) to twenty (20) degrees F. per minute or by other approved methods.

**910.6.3 Alternate shaft ventilation:** The skylight herein required may be



replaced by a window of equivalent area in the side of the shaft, provided the sill of such window is not less than two (2) feet above the adjoining roof, is equipped with an automatic vent opening, does not face on an interior lot line or within ten (10) feet thereof, and is not located within twenty (20) feet of an opening in adjacent walls.

**910.7 Bottom enclosure:** All shafts that do not extend to the bottom of the building or structure shall be enclosed at the lowest level with construction of the same strength and fireresistance rating as the lowest floor through which it passes, but not with a fireresistance rating less than that of the shaft enclosure.

**910.8 Existing shaftways:** In all existing shaftways of buildings of assembly (use group A) and institutional classifications (use group I), which are not already enclosed as herein required, the building official shall direct such construction as he may deem necessary to insure the safety of the occupants, subject to review by a board of survey as provided in Section 127.0.

**910.9 Shaft openings:** Openings other than necessary for the purpose of the shaftway shall not be constructed in shaft enclosures; and all openings shall be protected with approved fire doors, fire windows or fire shutters complying with the provisions of Sections 914.0, 915.0 and 916.0.

## SECTION 911.0 FIRERESISTANCE OF STRUCTURAL MEMBERS

**911.1 Requirements:** The fireresistance rating of construction assemblies and structural members shall comply with the requirements of Table 214 and Section 903.0.

**911.2 Protection of structural members:** Columns, girders, trusses, beams, lintels, or other structural members that are required to have a fireresistance rating and that support more than two (2) floors or one (1) floor and roof, or support a bearing wall, or a non-bearing wall more than two (2) stories high, shall be individually protected on all sides for their length or height with materials having the required fireresistance rating. All other structural members required to have a fireresistance rating may be protected by individual encasement, by a membrane or ceiling protection as specified in Section 912.0, or by a combination of both.

**911.3 Embedments and enclosures:** Pipes, wires, conduits, ducts or other service facilities shall not be embedded in the required fire protective covering of a structural member that is required to be individually encased.

**911.4 Impact protection:** Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise, or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or

other noncombustible material, to a height adequate to provide full protection, but not less than five (5) feet from the finished floor.

**911.5 Exterior structural members:** Structural members located in exterior walls or along the outer lines of a building or structure shall be protected as required by Table 214 for exterior bearing walls for the type of construction and shall be protected against corrosion by an approved method complying with Section 872.0. The interior faces of exterior structural members shall be protected and insulated with coverings of the required fireresistance rating specified for interior structural members in Table 214.

**911.6 Wall beams:** Beams and girders which support walls required to have a fireresistance rating shall be protected to afford not less than the fireresistance rating of the wall supported, but the fireresistance rating shall not be less than one (1) hour for members supporting masonry walls.

**911.7 Wall lintels:** Unless supported or suspended from structural wall girders protected with insulating materials of the required fireresistance rating or when the opening is spanned by a masonry arch of the required strength, all lintels over openings in masonry walls more than eight (8) feet in length shall be protected as required for structural members supporting walls for the type of construction.

**911.7.1 Stone lintels:** The use of stone lintels on spans exceeding four (4) feet shall not be permitted unless supplemented by fireresistance rated structural members or masonry arches of the required strength to support the superimposed loads.

**911.8 First story columns:** In buildings of exterior masonry wall (Type 3) construction, required fire protection may be omitted from first story columns supporting enclosure walls located on the street lot line.

## SECTION 912.0 FIRERESISTANCE RATED FLOOR/ROOF-CEILING ASSEMBLIES

**912.1 Installation of ceiling fixtures:** Fireresistive ceilings which constitute an integral part of a floor or roof assembly to meet a required fireresistance rating may have openings to accommodate noncombustible piping, ducts or electric outlets. The aggregate area of such openings in the ceiling shall be not greater than one hundred (100) square inches in any one hundred (100) square feet of ceiling area. The fixtures and attachments shall be installed so as not to decrease the fireresistance rating of the assembly. All duct openings shall be protected with approved noncombustible fire dampers.

**912.2 Ceiling panels:** Where the weight of lay-in ceiling panels, used as a part of fireresistive floor-ceiling or roof-ceiling assemblies, is not adequate to resist an upward force of one (1) pound per square foot (psf), wire

or other approved devices shall be installed above the panels to prevent vertical displacement under such upward force.

**912.3 Firestopping of ceiling spaces:** Floor and roof construction in which the secondary structural members are not individually encased in fireresistance rated materials or assemblies of component materials, shall be firestopped in areas of not more than three thousand (3,000) square feet with noncombustible materials. Such firestopping shall comply with Section 919.0, or solid web structural members may be substituted for such firestops. Where floor and roof construction with accompanying ceilings is made entirely of noncombustible or fireproof construction, firestopping may be omitted.

**912.4 Firestopping of wood joist construction:** Where the ceilings are suspended below wood joist floor construction, the space between the ceiling and the floor above shall be firestopped in areas of not more than one thousand (1,000) square feet with materials meeting the requirements of Section 919.0.

**912.5 Location of firestops:** Firestops shall be located directly over tenant separation walls, if the walls do not extend to the floor above.

**912.6 Unusable space:** In an assembly required to be of one (1) hour fireresistance rating, the ceiling membrane may be omitted over unusable space or the flooring may be omitted where unusable space occurs above.

**912.7 Openings in fireresistance rated floors:** The required fire resistance rating of floor or floor/ceiling assemblies shall be maintained where a penetration is made for electrical, mechanical, plumbing and communication conduits, pipes and systems.

## SECTION 913.0 ROOF CONSTRUCTION

**913.1 General:** Roof construction shall be protected with noncombustible material or assemblies of noncombustible materials to afford the fireresistance rating required by Table 214 as herein modified.

**913.2 Roofs 20 feet or higher:** When every part of the structural framework of roofs in Type 1 or Type 2 buildings is twenty (20) feet or more above the floor immediately below, all fire protection of the structural members may be omitted, including the protection of trusses, roof framing and decking. Heavy timber members, in accordance with Section 217.1, may be used for such unprotected members in one (1) story buildings.

**Exception:** Buildings of H (High Hazard), S-1 (Moderate Hazard Storage) or M (Mercantile) occupancies when of Type 1 or 2A construction shall not have less than one (1) hour fireresistance rated roof construction.

**913.3 Roof slabs, arches and decking:** Where the omission of fire protection from roof trusses, roof framing and decking is permitted, the horizon-

tal or sloping roofs in Type 1 and Type 2 buildings, immediately above such members, shall be constructed of noncombustible materials of the required strength without a specified fireresistance rating, or of mill type construction in buildings not over five (5) stories or sixty-five (65) feet in height.

**913.4 Firestopping:** Firestopping of ceiling and attic spaces shall be provided as required by Sections 875.0, 912.0 and 919.0.

### SECTION 914.0 EXTERIOR OPENING PROTECTIVES

**914.1 Where required:** Where specified herein, the exterior openings of all buildings and structures other than churches (use group A-4), residential buildings (use groups R-2 and R-3), buildings of unprotected noncombustible (Type 2C) construction, and buildings of frame (Type 4) construction shall have approved opening protectives meeting the requirements of this code and the provisions of Article 4 for special uses and occupancies.

**914.2 Horizontal exposure:** Approved protectives shall be provided in every opening where the fire separation is less than fifteen (15) feet.

**914.3 Vertical exposure:** Approved protectives shall be provided in every opening which is less than fifty (50) feet vertically above the roof of an adjoining or adjacent structure that is within a horizontal distance of thirty (30) feet of the wall in which the opening is located, unless such roof construction affords a fireresistance rating of not less than one and one-half (1½) hours.

**914.4 First story openings:** The required fireresistance rated opening protectives may be omitted in first story openings facing on a street or other public space not less than thirty (30) feet wide, when not extending more than twenty-five (25) feet above grade.

**914.5 Protected openings:** Required protective assemblies in exterior openings shall be fixed, or they may be self-closing, or provided with approved automatic self-closing devices.

**914.6 Unprotected openings:** Where a fireresistance rating is not required by this section for openings in exterior walls, windows and doors may be of unprotected wood. Glazing shall conform to the requirements of Article 8 and Article 19.

### SECTION 915.0 FIRE DOORS

**915.1 Fire door assemblies:** Approved fire door assemblies as defined in this code shall be constructed of any material or an assembly of component materials which meets the test requirements of Sections 903.0 and 904.0 and the fireresistance ratings herein required, unless otherwise specifically provided for in this code.

**Table 915**  
**FIRE DOOR FIRERESISTANCE RATINGS**

Location	Fireresistance rating in hours
Fire walls and fire separation walls of three (3) or more hour construction .....	3
Fire walls, fire separation walls and exitway enclosures of two (2) hour construction ..	1½
Shaft enclosures and elevator hoistways of two (2) hour construction .....	1½
Shaft enclosures of one (1) hour construction .....	1
Fire separation walls of one (1) hour construction .....	¾

**915.2 Labeled protective assemblies:** Labeled protective assemblies meeting the requirements of Sections 903.4.2 and 903.4.4 and the applicable standards listed in Appendix I, including shop inspection, shall be approved for use as provided for in this code.

### **915.3 Multiple doors**

**915.3.1 Fire walls:** Two (2) doors, each with a fireresistance rating of one and one-half (1½) hours, installed on opposite sides of the same opening, shall be deemed equivalent in fireresistance rating to one (1) three (3) hour fire door.

**915.3.2 Fire separation walls:** Two (2) doors of three-quarter (¾) hour fireresistance rating each, installed on opposite sides of the same opening shall be deemed equivalent in fireresistance rating to a one and one-half (1½) hour fire door; except when used in a required exitway.

**915.4 Glass panels:** Wired glass panels shall be permitted in fire doors within the limitations of Section 917.0 and as herein specifically prescribed.

**915.5 Closing devices:** Except as may be otherwise provided for openings in fire walls and fire separation walls, all fire doors shall be self-closing and shall be closed during occupancy of the building or part thereof. The building official may accept the use of rate of rise heat actuated devices meeting the requirements of the approved rules on doors that are normally required to be open for ventilation or other specified purposes when the safety of the occupants is not endangered thereby.

## **SECTION 916.0 FIRE WINDOWS AND SHUTTERS**

**916.1 Fireresistance rating:** Approved assemblies of fire windows and fire shutters shall meet the test requirements of Sections 903.0 and 904.0 or shall be approved labeled assemblies meeting the requirements of Section 903.4.4.

**916.1.1 Exception:** Steel window frame assemblies of one-eighth (⅛) inch minimum solid section or of not less than No. 18 Manufacturers Standard Gage (0.048 in.) formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision

for glazing with one-quarter ( $\frac{1}{4}$ ) inch wire glass as required in Section 917.0 when securely installed in the building construction and glazed with one-quarter ( $\frac{1}{4}$ ) inch labeled wired glass, shall be deemed to meet the requirements for a three-quarter ( $\frac{3}{4}$ ) hour fire window assembly.

**916.2 Window mullions:** All metal mullions which exceed a nominal height of twelve (12) feet shall be protected with insulating materials to afford the same fire resistance rating as required for the wall construction in which the protective is located.

**916.3 Swinging fire shutters:** When fire shutters of the swinging type are used in exterior openings, not less than one (1) row in every three (3) vertical rows shall be arranged to be readily opened from the outside and shall be identified by distinguishing marks or letters not less than six (6) inches high.

**916.4 Rolling fire shutters:** When fire shutters of the rolling type are used, they shall be of approved counterbalance construction that can be readily opened from the outside.

## SECTION 917.0 WIRED GLASS

**917.1 Maximum size:** One-quarter ( $\frac{1}{4}$ ) inch wired glass, which has been listed and labeled for use in approved labeled opening protectives, may be used with the size limitations described in Table 917.

Table 917  
LIMITING SIZE OF WIRED GLASS PANELS

Rating, opening	Max. area sq. in.	Max. height inches	Max. width inches
3 hour, Class A door	0	0	0
1 & 1½ hour, Class B doors	100	33	10
¾ hour, Class C door	1296	54	54
1½ hour, Class D door	0	0	0
¾ hour, Class E door	1296	54	54
Fire windows	1296	54	54

**917.1.1 Fire walls:** Wire glass in fire doors located in fire walls shall be prohibited, except when serving as horizontal exits, the self-closing swinging door may be provided with a vision panel of not more than one hundred (100) square inches without a dimension exceeding twelve (12) inches.

**917.1.2 Fire separation walls:** Wired glass vision panels may be used in fire doors of one and one-half (1½) hour fire resistance rating intended for use in fire separation walls; but the glass panels shall not be more than one hundred (100) square inches.

**917.2 Exitway protectives:** Unless specifically required in Article 4 to be solid in such locations where unusually hazardous conditions prevail, fire doors in elevator and stairway shaft enclosures may be equipped with approved wired glass vision panels which shall be so located as to furnish clear vision of the passageway or approach to the elevator or stairway. Such vision panels shall not exceed the size limitations specified for Class B doors.

**917.3 Fire separation walls:** One-quarter ( $\frac{1}{4}$ ) inch wired glass panels may be used in fire separation walls used for subdividing purposes as set forth in Section 909.1.3, provided the required fireresistance rating of the wall does not exceed one (1) hour. The maximum size of such panels shall not exceed the limitations for a three-quarter ( $\frac{3}{4}$ ) hour Class C door.

### SECTION 918.0 FIRERESISTIVE REQUIREMENTS FOR PLASTER

**918.1 Thickness of plaster:** The required thickness of fireresistance rated plaster protection shall be determined by the prescribed fire tests for specified use and type of construction and in accordance with the provisions of Section 819.0 for interior plastering and Section 820.0 for exterior plastering. The thickness in all cases shall be measured from the face of the lath when applied to fiber board, wood, or gypsum lath and from the back of metal lath.

**918.2 Plaster equivalents:** For fireresistive purposes, one-half ( $\frac{1}{2}$ ) inch of unsanded gypsum plaster shall be deemed equivalent to three-quarter ( $\frac{3}{4}$ ) inches of one (1) to three (3) sanded gypsum or one (1) inch portland cement sand plaster.

**918.3 Noncombustible furring:** In fireproof (Type 1) and noncombustible (Type 2) construction, plaster shall be applied directly on masonry or on approved noncombustible plastering base and furring.

**918.4 Double reinforcement:** Except in solid plaster partitions, or when otherwise determined by the prescribed fire tests, plaster protections more than one (1) inch in thickness shall be reinforced with an additional layer of approved lath imbedded at least three quarter ( $\frac{3}{4}$ ) inch from the outer surface and fixed securely in place.

**918.5 Plaster alternates for concrete:** In reinforced concrete construction, gypsum or portland cement plaster may be substituted for one-half ( $\frac{1}{2}$ ) inch of the required poured concrete protection, except that a minimum thickness of three-eighth ( $\frac{3}{8}$ ) inch of poured concrete shall be provided in all reinforced concrete floors and one (1) inch in reinforced concrete columns in addition to the plaster finish and the concrete base shall be prepared in accordance with Section 820.7.

### SECTION 919.0 FIRESTOPPING

**919.1 Where required:** Firestopping shall be designed and constructed



to close all concealed draft openings and to form effectual fire barriers against the spread of fire between stories of every building and in all open structural spaces therein, including the following locations: for the subdivision of attic spaces in Section 875.6; for combustible wall, partition and floor framing in Section 875.0; for ceiling spaces in Section 912.0; for open spaces behind acoustical and other finishes in Section 921.0; for floor sleeper spaces in Section 922.0; and for pipe, duct and flue openings in the mechanical code listed in Appendix B.

**919.2 Firestopping materials:** All firestopping shall consist of approved noncombustible materials securely fastened in place. Firestops of two (2) thicknesses of one (1) inch lumber with broken lap joint or one thickness of  $\frac{3}{4}$ -inch plywood with joints backed by  $\frac{3}{4}$ -inch plywood or of two (2) inch lumber installed with tight joints shall be permitted in open spaces of wood framing.

**919.3 Required inspection:** Firestopping shall not be concealed or covered from view until inspected and approved by the building official.

## SECTION 920.0 INTERIOR FINISH AND TRIM

**920.1 General:** Interior finish and interior trim of buildings shall conform to the requirements of this section. Interior finish shall include all wainscoting and paneling or other finish applied structurally or for acoustical treatment, insulation, decoration or similar purposes. The use of a surface finish of paper or of material of not greater fire hazard than paper shall not be prohibited provided such finish does not exceed one twenty-eighth ( $1/28$ ) of an inch in thickness, and is applied directly to a noncombustible base or substrate meeting the requirements of Section 903.6.2. Show windows in the first story of buildings may be of wood or of unprotected metal framing.

**920.2 Exposed construction:** These requirements shall not be considered as requiring the installation of interior finish, but where construction or fire protection materials are exposed in rooms or spaces used for the occupancies specified, the hazard from rate of flame spread of such exposed materials shall be not greater than that of the interior finish permitted for such occupancy or use. Exposed portions of structural members complying with the requirements for heavy timber type construction in Sections 217.0 and 853.0 shall not be subject to interior finish regulations.

**920.3 Smoke or gases:** Interior finish materials shall not be permitted that have a smoke developed factor greater than four hundred and fifty (450) when tested in accordance with the method of test for surface burning characteristics of building materials listed in Appendix G. When restrictions are not otherwise established in this code, interior finish is not controlled, except that pyroxlin or similar finishes shall not be applied which, as dry films, produce excessive smoke or toxic fumes when exposed to fire.



**920.4 Materials:** Material may be used for interior finish and trim only as specifically provided in this code for the occupancy or use of the space in which it is installed. Use of any material for floor finish, interior finish, and trim in a building of Type 1 or Type 2 construction within the scope permitted in this section or Section 922.0 shall not declassify the building with respect to its type of construction.

**920.4.1 Foam plastics:** Foam plastics shall not be used as interior finish except as provided in Section 876.5, or as interior trim except as provided in Section 920.6.

**920.5 Interior finish:** Interior finish of wall and ceilings shall have a flame spread rating not greater than that designated by the class prescribed for the various occupancy groups listed in Table 920 when tested in accordance with the requirements of Section 904.0.

**Table 920**  
**INTERIOR FINISH REQUIREMENTS**

Use groups	Required vertical exitways and passageways (d)	Corridors providing exitway access	Rooms or enclosed spaces (a)
A-1 Assembly, theatres	I	I	II (b)
A-2 Assembly, night clubs	I	I	II (b)
A-3 Assembly, halls, terminals, restaurants	I	I	II (b)
A-4 Assembly, churches, schools	I	I	III
B Business	I	II	III
F Factory and industrial	I	II	III
H High hazard	I	II	III
I-1 Institutional, restrained	I	I	I (c)
I-2 Institutional, incapacitated	I	II	I (c)
M Mercantile walls, ceilings	I	II	III
R-1 Residential, hotels	I	II	II (e)
R-2 Residential, multi-family dwellings	I	II	III
R-3 Residential, 1 and 2 family dwellings	III	III	III
S-1 Storage, moderate hazard	I	II	III
S-2 Storage, low hazard	I	II	III

**Note a.** Requirements for rooms or enclosed spaces are based upon spaces enclosed in partitions of the building or structure, and where fire resistance rating is required for the structural elements the enclosing partitions shall extend from the floor to the ceiling. Partitions which do not comply with this shall be considered as enclosing spaces and the rooms or spaces on both sides thereof shall be counted as one. In determining the applicable requirements for rooms or enclosed spaces, the specific use or occupancy thereof shall be the governing factor, regardless of the occupancy group classification of the building or structure. When an approved automatic fire suppression system is provided, the interior finish of Class II or III materials may be used in place of Class I or II materials respectively, where required in the table.

**Note b.** Class III interior finish materials may be used in place of assembly with a capacity of three hundred (300) persons or less.

**Note c.** Class III interior finish materials may be used in administrative areas. Class II interior finish materials may be used in individual rooms of not over four (4) persons capacity. Provisions in Note a allowing a change in interior finish classes when fire suppression protection is provided shall not apply.

**Note d.** Class III interior finish materials may be used for wainscoting or paneling for not more than one thousand (1,000) square feet of applied surface area in the grade lobby when applied directly to a non-combustible base or over furring strips applied to a noncombustible base and fire-stopped as required by Section 921.0.

**Note e.** Class III interior finish materials may be used in mercantile occupancies of three thousand (3,000) square feet or less gross area. Used for sales purposes on the street floor only. (Balcony permitted).

**920.5.1 Basements:** In buildings other than 1- and 2-family residences, Class I or II interior finish shall be used in all basements or other underground spaces from which there is not direct exit to the outside of the building if subject to occupancy for any purpose other than storage or service facilities.

**920.5.2 Maximum flame spread:** Interior finish materials with flame spread classifications in excess of two hundred (200) shall not be used in any room or space subject to human occupancy, except to such extent as may be specifically permitted by the building official on the basis of a finding that such use does not significantly increase the life hazard.

**920.6 Interior trim:** Baseboards, chair-rails, mouldings, trim around openings and other interior trim, not in excess of ten (10) per cent of the aggregate wall and ceiling areas of any room or space, may be of Class I, II or III materials, except that trim around fire windows and fire doors shall comply with the requirements of Section 915.0 and Section 916.0.

**920.7 Carpets:** Carpet type floor coverings shall qualify under the provisions of the Department of Commerce (DOC) "Pill Test" (DOC FF-1-70) listed in Appendix G.

## SECTION 921.0 APPLICATION OF INTERIOR FINISH

**921.1 Attachment:** Where interior finish is regulated by the requirements of this code, interior finish materials shall be applied or otherwise fastened in such a manner that they will not readily become detached when subjected to room temperatures of two hundred (200) degrees F. or less for thirty (30) minutes, or otherwise become loose through changes in the setting medium from the effects of time or conditions of occupancy.

**921.2 Application to structural elements:** Interior finish materials applied to walls, ceilings, or structural elements of a building or structure which are required to be fireresistance rated or to be constructed of noncombustible component materials, shall be applied directly against the exposed surface of such structural elements, or to furring strips attached to such surfaces with all concealed spaces created thereby firestopped where in excess of ten (10) square feet in area or eight (8) feet in any dimension.

**921.3 Furred construction:** Where walls, ceilings or other structural elements are required to be fireresistance rated or to be constructed of noncombustible component materials and interior finish is set out or dropped distances greater than one and three-quarter (1¾) inches from the surface of such elements, only material of which both faces qualify as Class I shall be used, unless the finish material is protected on both sides by an automatic fire suppression system (see Note a to Table 920) or is

attached to a noncombustible backing complying with Section 921.6 or to furring strips applied directly to such backing as provided in Section 921.2.

**921.4 Heavy timber construction:** Interior finish materials may be applied directly to the wood members and decking of heavy timber (Type 3 A) construction, where permitted, or to furring strips applied to such members or wood decking as provided in Section 921.2.

**921.5 Class II and III material:** Interior finish materials, other than Class I material, which are less than one-fourth ( $\frac{1}{4}$ ) inch in thickness shall be applied directly against a noncombustible backing or a backing complying with the requirements of Section 903.6.2 unless the tests under which such material has been classed were made with the materials suspended from the noncombustible backing.

**921.6 Backing material:** Backing for interior finish materials shall be a continuous surface with permanently tight joints, equal in area to the area of the finish, and extending completely behind such finish in all directions; and may be of any materials meeting the requirements of this code for noncombustible classification of material under Section 903.5.1 or of fire-retardant treated wood. When the backing does not constitute an integral part of the structural elements or system, it shall be attached directly to the structural elements or to furring strips as required for the application of finish according to Section 921.2, or may be suspended from the structural members at any distance provided concealed spaces created thereby shall be firestopped in accordance with the applicable requirements of this code. Where Class III interior finish is applied to a continuous noncombustible backing beneath wood joist construction, the allowable area for firestopping required in Section 912.4 may be increased to three thousand (3,000) square feet.

## SECTION 922.0 COMBUSTIBLE MATERIALS PERMITTED IN FLOOR CONSTRUCTION OF TYPE 1 AND TYPE 2 BUILDINGS

**922.1 General:** Except as provided in Section 616.0 for stairs and Section 417.0 for theatres and similar places of public assembly (use groups A-1 and A-2), the use of combustible materials in or on floors of Type 1 and Type 2 buildings shall be herein specified.

**922.2 Sleepers, bucks, and grounds:** Floor sleepers, bucks, nailing blocks and grounds may be constructed of combustible materials, provided the space between the fireresistance rated floor construction and the flooring is either solidly filled with noncombustible materials or firestopped in areas of not more than one hundred (100) square feet, provided such open spaces shall not extend under or through permanent partitions or walls.

**922.3 Flooring:** Wood finish floorings may be attached directly to the embedded or firestopped wood sleepers and wood finish flooring shall be permitted when cemented directly to the top surface of approved fire-resistance rated construction or cemented directly to a wood subfloor attached to sleepers as provided in Section 922.2. Combustible insulating boards not more than one-half ( $\frac{1}{2}$ ) inch thick and covered with approved finished flooring may be used for sound deadening or heat insulating when attached directly to a noncombustible floor assembly or to wood subflooring attached to sleepers as provided in Section 922.2.

### **SECTION 923.0 DECORATIVE MATERIAL RESTRICTIONS**

**923.1 General:** In places of public assembly, all draperies, hangings, and other decorative materials suspended from walls or ceilings shall be noncombustible or flamer-resistant meeting the requirements of Section 904.0 as herein specified.

**923.2 Noncombustible:** The permissible amount of noncombustible decorative hangings shall not be limited.

**923.3 Flamer-resistant:** The permissible amount of flamer-resistant decorative hangings shall not exceed ten (10) per cent of the total wall and ceiling area.

### **SECTION 924.0 EXTERIOR TRIM RESTRICTIONS**

**924.1 Gutters and leaders:** All gutters and leaders hereafter placed on buildings and structures other than frame (Type 4) buildings, one- and two-family dwellings and private garages and similar accessory buildings shall be constructed of noncombustible materials.

#### **924.2 Architectural trim**

**924.2.1 Construction requirements:** All architectural trim, such as cornices and other exterior architectural elements attached to the exterior walls of buildings of Types 1 and 2 construction shall be constructed of approved noncombustible materials and shall be secured to the wall with metal or other approved noncombustible brackets; except that outside the fire limits, such trim may be of combustible material when the building does not exceed three (3) stories or forty (40) feet in height. Combustible trim may be used on all buildings of Types 3 and 4 construction.

**924.2.2 Location:** When combustible architectural trim is located along the top of exterior walls it must be completely backed up by the exterior wall and shall not extend over or above the top of exterior walls.

**924.2.3 Firestopping:** Continuous exterior architectural trim constructed of combustible materials shall be firestopped as required in Section 875.0.

**924.3 Combustible half timbering:** In buildings of masonry (Type 3) construction that do not exceed three (3) stories or forty (40) feet in height, exterior half-timbering and similar architectural decorations may be constructed of wood or other equivalent combustible materials, provided such trim is backed up solidly with approved noncombustible materials.

**924.4 Balconies:** All balconies attached to or supported by buildings of Types 1 and 2 construction shall be constructed of noncombustible materials. Balconies attached to or supported by buildings of Types 3 and 4 construction may be of unprotected noncombustible materials or frame construction. Balconies of frame construction shall afford the fireresistance rating required by Table 214 for floor construction and the aggregate length shall not exceed fifty (50) per cent of the building perimeter on each floor.

**924.5 Bay and oriel windows:** All bay and oriel windows attached to or supported by walls other than frame construction shall be of noncombustible construction, framed with brackets of steel, concrete or other approved noncombustible materials, unless specifically exempted by Section 302.0.

**924.6 Existing combustible construction:** Any existing cornice or other exterior architectural element constructed of wood or similar combustible materials may be repaired with the same material to the extent of fifty (50) per cent of its area in any one (1) year if the public safety is not thereby endangered.

**924.7 Wood veneers:** Inside the fire limits wood veneers are permitted in accordance with Section 302.0.

## SECTION 925.0 ROOF STRUCTURES

**925.1 General:** All construction, other than aerial supports, clothes dryers and similar structures less than twelve (12) feet high, water tanks and cooling towers as hereinafter provided and flag poles, erected above the roof of any part of any building or structure located within the fire limits or of any building or structure more than forty (40) feet in height outside the fire limits shall be constructed of noncombustible materials.

**925.2 Scuttles:** Trap doors and scuttles as required by Section 617.0 shall be not less than two (2) feet by three (3) feet in size and shall be of fireresistance rated construction in fireproof (Types 1A and 1B), and noncombustible (Type 2) buildings and of approved noncombustible materials, or of wood covered on top and edges with sheet metal in exterior masonry (Type 3) and protected frame (Type 4A) buildings.

### 925.3 Skylight

**925.3.1 Sash and frames:** Sashes and frames of all skylights on buildings

of Types 1 and 2 construction shall be constructed of steel or other approved noncombustible materials. In foundries or buildings where acid fumes deleterious to metal are incidental to the use of the building, treated wood or other approved noncorrosive materials shall be permitted.

**925.3.2 Glass, wired or plain:** Skylights shall be glazed with wired glass or of approved glass block construction conforming to Sections 811.0 and 860.0, except that skylights placed over shafts and stair enclosures and skylights used for emergency heat and smoke ventings shall be glazed with plain glass not over one-eighth ( $\frac{1}{8}$ ) inch thick. A single panel of wired glass in skylights shall not exceed seven hundred twenty (720) square inches in area or forty-eight (48) inches in any dimension. Light transmitting plastic may be used as specified in Section 1905.0.

**925.3.3 Screens:** Plain glass skylights shall be protected by substantial corrosion-resistive metal or other approved noncombustible screens having a mesh not less than three-quarter ( $\frac{3}{4}$ ) by three-quarter ( $\frac{3}{4}$ ) inches nor larger than one-by-one (1x1) inches, constructed of not lighter than No. 12 B and S Gage (0.0808 inch) wires. The screen shall be erected at a distance of not less than four (4) nor more than ten (10) inches above all glazed portions of the skylight and shall project on all sides for a distance of not less than the height of the screen above the glass. A similar screen shall be placed below the skylight to afford protection to the occupants of the building. The provisions for wired glass or screen protection shall not apply to glass block skylights or to greenhouse construction.

**925.4 Penthouses:** Penthouses shall be considered a part of the next lower story and the enclosure shall conform to the requirements for exterior walls of the building type as regulated by Table 214 and Article 8 except as modified herein.

**925.4.1 Recessed walls:** When the exterior wall of a penthouse is recessed five (5) feet or more from the exterior wall of the next lower story and the exterior wall of the next lower story is required to have a fireresistance rating of greater than one and one-half ( $1\frac{1}{2}$ ) hours, the penthouse exterior wall may be constructed with a fireresistance rating of not less than one and one-half ( $1\frac{1}{2}$ ) hours, covered on the outside with noncombustible, weatherproof material and supported on protected steel or reinforced concrete construction.

**925.4.2 Doors, frames, and sash:** Doors, frames, and window sash, except where otherwise specifically required to be fireproof or fireresistance rated under this code, shall be constructed the same as other similar elements in the building or structure.

**925.5 Other enclosed roof structures:** Enclosed roof structures, other than the penthouses as defined in Article 2, shall be considered a story of the building and the enclosure shall conform to the requirements for exterior walls of the building type as regulated by Table 214 and Article 8

and the provisions described in the following Sections 925.5.1 and 925.5.2.

**925.5.1 Noncombustible materials:** Unless constructed of masonry or reinforced concrete in accordance with Article 8, roof structures erected on buildings and structures of fireproof or noncombustible (Types 1 or 2) constructions shall be enclosed in walls of noncombustible materials having a fireresistance rating of not less than one (1) hour, protected with weather-resistive roof coverings complying with Section 926.0.

**925.5.2 Combustible materials:** Roof structures erected on the roof of exterior masonry buildings (Type 3) and protected frame buildings (Type 4A) may be constructed of combustible materials protected to afford a one (1) hour fireresistance rating covered on the outside with approved roofing materials.

## **925.6 Mansard roofs and other sloping roofs**

**925.6.1 High slope roofs:** Every mansard roof or other sloping roof having a pitch of more than sixty (60) degrees to the horizontal hereafter erected on any building or structure of other than Type 4 frame construction more than three (3) stories or forty (40) feet in height shall be constructed of noncombustible materials with a fireresistance rating of not less than one (1) hour; except that when the building is more than seven (7) stories or eighty-five (85) feet in height, such roofs shall afford the same fireresistance rating required for the exterior walls of the building but need not exceed one and one-half (1½) hour fireresistance rating.

**925.6.2 Low slope roofs:** When the pitch is less than sixty (60) degrees to the horizontal, the mansard roof or other sloping roof located on any building may be constructed of the same materials as required for the roof of the building.

**925.7 Dormers:** The sides and roofs of dormers shall be of the same type of construction as the main roof construction; except that where a side of the dormer is merely a vertical extension of an exterior wall it shall be subject to the same fireresistance rating requirements as apply to the wall of the building. The roofs of dormers shall be protected with approved roof coverings complying with Section 926.0. The side of dormers shall be protected with approved roof coverings or with material which would be permitted for covering the exterior walls of the building.

## **925.8 Water tanks**

**925.8.1 Supports:** Water tanks having a capacity of more than five hundred (500) gallons placed in or on a building shall be supported on masonry, reinforced concrete, steel or other approved noncombustible framing or on timber conforming to heavy timber mill construction (Type 3A); provided that, when such supports are located in the building above the lowest floor, they shall be fireresistance rated as required for fireproof (Type 1A) construction.



**925.8.2 Emergency discharge:** A pipe or outlet shall be located in the bottom or in the side close to the bottom, or the tank shall be fitted with a quick-opening valve to enable the contents to be discharged in an emergency to a suitable drain complying with the plumbing code listed in Appendix B.

**925.8.3 Location:** A tank shall not be located over or near a stairway or elevator shaft unless a solid roof or floor deck is constructed underneath the tank.

**925.8.4 Tank cover:** All unenclosed roof tanks exposed to the weather shall have approved covers sloping towards the outer edges.

**925.8.5 Hoop and strap protection:** When metal hoops are used in the construction of wood tanks, they shall be protected with acceptable corrosion-resistive coatings or shall be manufactured from approved corrosion-resistive alloys.

## **925.9 Cooling towers**

**925.9.1 Located in fire limits:** Within the fire limits, cooling towers erected on the roofs of buildings shall be constructed of noncombustible materials, except that drip bars may be of wood. Cooling towers may be constructed entirely of fire retardant treated wood, including drip bars.

**925.9.2 Located outside fire limits:** Outside the fire limits, cooling towers may be constructed of wood or other approved materials of similar combustible characteristics; except that when the base of the tower is more than fifty-five (55) feet above grade and the tower is located on a building, the drip bars only may be fabricated of combustible materials as herein provided.

**925.10 Miscellaneous roof structures:** Except as herein specifically provided, all towers, spires, dormers or cupolas shall be erected of the type of construction and fireresistance rating required for the building to which they are accessory as regulated by Tables 214 and 305; except that when the height of such appurtenant structures exceeds eighty-five (85) feet above grade or when the area at any horizontal section of the tower, spire, dormer or cupola exceeds two hundred (200) square feet or when it used for any purpose other than as a belfry or architectural embellishment, the structure and its supports shall be of fireproof (Type 1) construction, noncombustible (Type 2) construction or fire-retardant treated wood complying with Sections 903.6.1 and 903.6.2. Radio and television towers and antennae shall be constructed to comply with Sections 426.0 and 427.0.

## **SECTION 926.0 ROOF COVERINGS**

**926.1 Classification:** All approved roof coverings shall meet the test requirements and be classified in accordance with Section 903.3 of this code.

**926.2 Existing roofs:** The repair of existing roofs shall comply with



provisions of Section 106.0 but more than twenty-five (25) per cent of the roof covering of any building shall not be replaced in a period of twelve (12) months unless the entire roof covering is made to conform to the requirements for new roofing.

### **926.3 Classification of use**

**926.3.1 Class A roof coverings:** Class A roof coverings shall be permitted for use in buildings and structures of all types of construction.

**926.3.2 Class B roof coverings:** Class B roof coverings shall be permitted as the minimum for use in buildings and structures of Type 1 construction.

**926.3.3 Class C roof coverings:** Class C roof coverings shall be permitted as the minimum for use in buildings and structures of Types 2, 3 and 4A construction.

**926.3.4 Non-classified roof coverings:** Non-classified roof coverings shall be permitted on the buildings and structures listed below.

1. Buildings and structures of unprotected frame (Type 4B) construction when the distance from any other building is not less than twelve (12) feet.
2. Private garages, airplane hangers and similar accessory structures, not exceeding one (1) story or twenty (20) feet in height and twenty-five hundred (2500) square feet in area, when outside the fire limits, located in the same lot with a dwelling and with a fire separation of not less than twelve (12) feet.
3. Moderate and low hazard storage buildings (use groups S-1 and S-2) not exceeding one (1) story or twenty (20) feet in height and six thousand (6,000) square feet in area with a fire separation of not less than twelve (12) feet.

Fire walls may be used to obtain the required fire separation.

**926.4 Roof insulation:** The use of cork, fiber board and other combustible roof insulation shall be permitted provided it is covered with approved roof coverings directly applied thereto.

**926.5 Grounding of metal roofs:** Whenever, because of hazard resulting from electrical equipment or apparatus located thereon, or because of proximity to power lines, or for any other reason, it is deemed necessary by the building official, metal roofs shall be grounded by bonding together each course or strip and the bonding conductor or conductors shall be extended to and attached in an approved manner to the grounding electrode used to ground the electrical system within the building on which such metal roofing is applied. The conductors used to bond courses or strips of metal roofing together, or any conductor extended for grounding to the grounding electrode, shall not have greater resistance than the conductor used to ground the electrical system within the building.

**926.5.1 Alternate methods of grounding metal roofing:** Alternate methods of grounding metal roofing may be used, provided they are at least equal in performance to the methods described herein, and further provided that such desired method is first submitted to and approved by the building official.

**926.6 Shingle application:** Asphalt shingles laid with double coverage may be installed on slopes below four (4) to twelve (12) inches to as low as two (2) to twelve (12) inches, provided the shingles are approved self-sealing shingles or are hand sealed and are installed with an underlayment consisting of two layers of No. 15 felt, applied shingle fashion. In areas where the January daily average temperature is twenty-five (25) degrees F. or less, or where there is a possibility of ice forming along the eaves and causing a back up of water, the two layers of felt shall be cemented together from the eaves up the roof to overlie a point twenty-four (24) inches inside the interior wall line of the building.

#### **926.7 Re-roofing**

**926.7.1 Asphalt shingle application:** Not more than two (2) overlay of asphalt shingles shall be applied over an existing asphalt shingle roof. Not more than two (2) overlay of asphalt shingles shall be applied over wood shingles. Asphalt shingles applied over wood shingles shall have an underlay of not less than Type 30 non-perforated felt.

**926.7.2 Wood shake application:** Not more than one (1) overlay of wood shakes shall be applied over an existing asphalt shingle or wood shingle roof. One (1) layer of eighteen (18) inch Type 30 felt shall be interlaced between each layer of shakes.

**926.7.3 Application over shakes:** New roof covering shall not be applied over an existing shake roof.

**926.7.4 Flashing and edgings:** Rusted or damaged flashing, vent caps and metal edgings shall be replaced with new materials as necessary.

# **ARTICLE 10**

## **CHIMNEYS, FLUES AND VENT PIPES**

### **SECTION 1000.0 GENERAL**

**1000.1 Scope:** The provisions of this article shall control the design, installation, maintenance, repair and approval of all chimneys, vents and connectors hereafter erected or altered in all building and structures.

**1000.2 Other standards:** Unless otherwise specifically provided herein, conformity to the applicable requirements for chimney construction and vents contained in the mechanical code listed in Appendix B shall be deemed to meet the requirements of this code.

**1000.3 Minor repairs:** Minor repairs for the purpose of maintenance and upkeep which do not increase the capacity of the heating apparatus or appliances, or which do not involve structural changes in the permanent chimney and vents of a building, may be made without a permit.

### **SECTION 1001.0 PLANS AND SPECIFICATIONS**

**1001.1 General:** The structural plans and specifications shall describe in sufficient detail, the location, size and construction of all chimneys, vents and ducts and their connections to boilers, furnaces, appliances and fireplaces. The thickness and character of all insulation materials, clearances from walls, partitions and ceilings and proximity of heating devices and equipment to wall openings and exitways shall be clearly shown and described.

**1001.2 Appliances:** All appliances required to be vented shall be connected to a vent or chimney, except as provided in Section 1006.3 and as provided in the standards listed in Appendix B for special venting arrangements.

### **SECTION 1002.0 PERFORMANCE TEST AND ACCEPTANCE CRITERIA**

**1002.1 Tests:** The building official may require a test or tests of any chimney or vent to insure fire safety and the removal of smoke and products of combustion.

**1002.2 Acceptance criteria:** The system shall be accepted if the following conditions are fulfilled.

1. There shall not be spillage at the draft hood when any one (1) or combination of appliances connected to the system is in operation.
2. Temperature on adjacent combustible surfaces shall not be raised more than limits acceptable to nationally recognized testing or inspection agencies.
3. Condensation shall not be developed in a way that would cause deterioration of the vent or chimney drip from joints or bottom end of the vent or chimney.
4. The draft reading taken at the place recommended in the installation instructions shall be within the range specified by the appliance manufacturer.

**1002.2.1 Approved installations:** Factory-built chimneys and gas vents which have been tested and listed by a nationally recognized testing or inspection agency shall be accepted as complying with the requirements of item 2 of Section 1002.2 when installed in accordance with the clearances specified in their listing.

## **SECTION 1003.0 CHIMNEYS**

**1003.1 Classification:** Chimneys as used in this article shall be classified as:

1. factory-built chimneys,
2. masonry chimneys, and
3. metal chimneys (smokestacks).

## **SECTION 1004.0 APPLIANCES REQUIRING CHIMNEYS**

**1004.1 General:** All heating appliances, except those appliances specifically exempted by the provisions of Section 1006.3 shall be connected to chimneys as specified in the Chimney selection chart contained in the mechanical code listed in Appendix B.

## **SECTION 1005.0 EXISTING BUILDINGS**

**1005.1 Raising existing chimneys:** Whenever a building is hereafter erected, enlarged or increased in height so that a wall along an interior lot line, or within three (3) feet thereof, extends above the top of an existing chimney or vent of an adjoining existing building, the owner of the building so erected, enlarged or increased in height shall carry up at his own expense, with the consent of the adjoining property owner, either independently, or in his own building, all chimneys connected to fuel-burning appliances. Vents within six (6) feet of any portion of the wall of

such adjoining building shall be extended two (2) feet above the roof or parapet of the adjoining building.

**1005.2 Size of extended chimneys:** The construction of an extended chimney shall conform to the requirements of this article for new chimneys, but the internal area of such extension shall not be less than that of the existing chimney.

**1005.3 Notice to adjoining owner:** It shall be the duty of the owner of the building which is erected, enlarged or increased in height to notify in writing, and to secure the consent of, the owner of existing chimneys affected at least ten (10) days before starting such work.

**1005.4 Existing chimneys:** An existing chimney, except one which does not endanger the fire safety of a building or structure and is acceptable to the building official, shall not be continued in use unless it conforms to all requirements of this article for new chimneys.

**1005.5 Cleanouts and maintenance:** Whenever a new chimney is completed or an existing chimney is altered, it shall be cleaned and left smooth on the inside. If the chimney is constructed of masonry or tile, the interior mortar joints must be left smooth and flush. Cleanouts or other approved devices shall be provided at the base of all chimneys to enable the passageways to be maintained and cleaned.

## SECTION 1006.0 VENT SYSTEMS

**1006.1 Listed appliances:** For the purpose of determining vent requirements, gas-fired and oil-fired appliances shall be classified as "listed" or "unlisted." A listed appliance is one that is shown in a list published by an accredited authoritative testing agency, qualified and equipped for experimental testing of such appliances, and maintaining an adequate periodic inspection of current production of listed models and whose listing states either that the appliance or accessory complies with nationally recognized safety requirements or has been tested and found safe for use in a specific manner. Compliance may be determined by the presence on the appliance or accessory of a label of the testing agency stating that the appliance or accessory complies with nationally recognized safety requirements. An unlisted appliance or accessory is one that is not shown on such a list or does not bear such a label. In cases where an applicable standard has not been developed for a given class of appliance or accessory, approval of the authority having jurisdiction should be obtained before the appliance or accessory is installed.

**1006.2 Appliances required to be vented:** Appliances shall be connected to a listed venting system or provided with other means for exhausting the flue gases to the outside atmosphere in accordance with the Venting system selection chart contained in the mechanical code listed in Appendix B.

**1006.3 Exemption:** Connections to vent systems shall not be required for appliances of such size or character that the absence of such connection does not constitute a hazard to the fire safety of the building or its occupants. The following appliances are not required to be vented unless so required by their listing:

1. listed gas ranges;
2. built-in domestic cooking units listed and marked as unvented units;
3. listed hot plates and listed laundry stoves;
4. listed domestic clothes dryers;
5. listed gas refrigerators;
6. counter appliances;
7. space (room) heaters listed for unvented use, only upon prior approval by the building official;
8. specialized equipment of limited input such as laboratory burners or gas lights; and
9. electric appliances.

When any or all of the appliances listed in items 5, 6 and 7 above are installed so that the aggregate input rating exceeds thirty (30) British thermal units (Btus) per hour per cubic foot of room or space in which they are installed, one (1) or more of them shall be vent connected or provided with approved means for exhausting the vent gases to the outside atmosphere so that the aggregate input rating of the remaining unvented appliance does not exceed thirty (30) Btus per hour per cubic foot of room or space in which they are installed. Where the room or space in which they are installed is directly connected to another room or space by a doorway, arch, or other opening of comparable size, which cannot be closed, the volume of such adjacent room or space may be included in the calculations.

## SECTION 1007.0 FIREPLACES

**1007.1 General:** Fireplaces, barbecues, smoke chambers and fireplace chimneys shall be of solid masonry or reinforced concrete or other approved materials, and shall conform to requirements of this section.

**1007.2 Construction:** Structural walls of fireplaces shall be at least eight (8) inches thick. Where a lining of low duty refractory brick (ASTM C64) or the equivalent, at least two (2) inches thick laid in fire clay mortar (ASTM C105, medium duty), or the equivalent, or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than eight (8) inches. Where such lining is not provided, the thickness of back and sides shall be not less than twelve (12) inches. The firebox shall be twenty (20) inches in depth and will be permitted to be open on all sides, provided all fireplace openings are located entirely within one (1) room.

**1007.3 Lining:** The lining shall extend from the throat of the fireplace to a point at least four (4) inches above the top of the enclosing masonry walls.

#### **1007.4 Clearance**

**1007.4.1 Distance:** The distance between fireplace and combustibles shall be at least four (4) inches; and such combustibles shall not be placed within six (6) inches of the fireplace opening. Wood facings or trim normally placed around the fireplace opening may be permitted when conforming to the requirements of this section; however, such facing or trim shall be furred out from the fireplace wall at least four (4) inches and attached to noncombustible furring strips. The edges of such facings or trim shall be covered with a noncombustible material. Where the walls of the fireplace are twelve (12) inches thick, the facings or trim may be directly attached to the fireplace.

**1007.4.2 Metal hoods:** Metal hoods used as part of a fireplace or barbecue shall be at least eighteen (18) inches from combustible material unless approved for reduced clearances.

**1007.5 Metal:** Metal hoods used as a part of a fireplace or barbecue shall be at least No. 18 B&S (0.0403 inch) Gage sheet copper, No. 18 Galvanized Steel Gage (0.052 in.) galvanized steel or other equivalent corrosion-resistant ferrous metal with all seams and connections of smokeproof unsoldered construction. The hoods shall be sloped at an angle of forty-five (45) degrees or less from the vertical and shall extend horizontally at least six (6) inches beyond the limits of the firebox.

**1007.6 Metal heat circulators:** Approved metal heat circulators may be installed in fireplaces, provided the thickness of the fireplace walls is not reduced.

**1007.7 Smoke chamber:** All walls, including back walls, shall be at least eight (8) inches in thickness.

**1007.8 Areas of flues, throats and dampers:** The net cross-sectional area of the flue and of the throat between the firebox and the smoke chamber of a fireplace shall be at least that required in the mechanical code listed in Appendix B. When dampers are used, damper openings shall be at least, when fully opened, equal to the required flue area and shall be of No. 12 Galvanized Steel Gage (0.018 in.) metal.

**1007.9 Lintel:** Masonry over the fireplace opening shall be supported by a noncombustible lintel.

**1007.10 Hearth:** Every fireplace shall be constructed with a hearth of brick, stone, tile or other noncombustible material. For fireplaces with an opening of less than six (6) square feet, the hearth shall extend not less

than sixteen (16) inches in front and not less than eight (8) inches on each side of the fireplace opening. For fireplaces with an opening of six (6) square feet or more, the hearth shall extend not less than twenty (20) inches in front and not less than twelve (12) inches on each side of the fireplace opening. Such hearths shall be supported on trimmer arches of brick, stone, tile or concrete not less than four (4) inches thick or other equally strong and fireresistance rated materials. All combustible forms or centering shall be removed after completion of the supporting construction.

**1007.11 Firestopping:** Firestopping between chimneys and wooden construction shall meet the requirements specified in Section 919.0 and the mechanical code listed in Appendix B.

**1007.12 Support:** Fireplaces shall be supported on foundations designed in conformity with Section 725.0.

**1007.13 Screens:** Screens or other acceptable protection devices shall be provided for all fireplace openings.

**1007.14 Other type fireplaces:** Other fireplaces not conforming to the requirements of this section shall be subject to approval by the department prior to installation. Imitation fireplaces shall not be used for the burning of gas, solid or liquid fuel. Approved factory-built fireplaces may be installed and shall conform to the applicable portions of this code. Factory-built fireplaces shall bear the seal of a nationally recognized testing or inspection agency.

**1007.15 Solid wastes:** Solid waste shall not be burned in a fireplace.

## SECTION 1008.0 INCINERATORS

**1008.1 Mechanical code:** Incinerators of all types shall be installed in accordance with the applicable provisions of the mechanical code listed in Appendix B.

## SECTION 1009.0 CONSTRUCTION OF METAL DUCTS AND VENTS

**1009.1 Mechanical code:** All metal vents, ducts and duct systems required under the provisions of this article for heating systems and equipment, and under the provisions of Article 5 for ventilating and air-conditioning systems shall be constructed and installed in accordance with the requirements of the mechanical code listed in Appendix B.

**1009.2 Construction of ducts:** Ducts and plenums may be constructed of approved material constructed in accordance with the requirements of the mechanical code listed in Appendix B. Non-metallic ducts shall be



constructed and installed in accordance with their approval and the applicable standards listed in Appendix B. Aluminum ducts shall not be used in equipment rooms with fuel-fired equipment, encased in or under concrete slabs on grade, for kitchen or fume exhausts or in systems where air entering the duct is over two hundred fifty (250) degrees F.

### **SECTION 1010.0 SPARK ARRESTORS**

**1010.1 Mechanical code:** All chimneys, stacks and flues, including incinerator stacks, which emit sparks shall be provided with a spark arrestor conforming to the requirements of the mechanical code listed in Appendix B.



# ARTICLE 11

## MECHANICAL EQUIPMENT AND SYSTEMS

### SECTION 1100.0 GENERAL

**1100.1 Scope:** The provisions of this article shall control the construction, inspection and maintenance of all mechanical equipment and systems in respect to structural strength, fire safety and operation.

**1100.2 Mechanical code:** All mechanical equipment and systems shall be constructed, installed and maintained in accordance with the mechanical code listed in Appendix B.

### SECTION 1101.0 PLANS AND SPECIFICATIONS

**1101.1 General:** Plans and specifications for the installation, repair, extension or removal of any mechanical equipment or system shall be submitted in accordance with the mechanical code listed in Appendix B and a permit shall be secured prior to the commencement of any work.

**1101.2 Matter covered:** The plans and specifications shall show in sufficient detail all pertinent features and clearances of the appliances and systems, including: size and type of apparatus; construction of flue, stack or chimney; stack connections; type of fuel; method of operation; and the method of compliance with all regulations for the class and type of equipment installed.

**1101.3 Details:** An application for permit shall be accompanied by specifications and diagrammatic mechanical drawings in sufficient detail, complying with the provisions of the mechanical code listed in Appendix B, before a permit shall be issued for the mechanical equipment and system. The plans shall be drawn to a scale of not less than one-eighth ( $\frac{1}{8}$ ) inch to the foot and shall show the location and arrangement of all equipment and distribution elements including safeties and pressure controlling devices.

### SECTION 1102.0 INSPECTIONS AND TESTS

**1102.1 Inspection:** All mechanical equipment and systems requiring a permit shall be inspected in accordance with the mechanical code listed

in Appendix B and shall not be placed in operation until it has been tested and approved.

**1102.2 Concealment:** It shall be unlawful for owners, contractors or workmen to lath over, or in any way to conceal, any piping, outlet boxes or other parts of the mechanical equipment or system requiring a permit until an inspection has been made thereof and due notice given that the work has been approved.

**1102.3 Defects and repairs:** Upon inspection or reinspection of a mechanical system, any defects or deficiencies which require repair to insure safe operation shall be rectified before the system is placed in use.

**1102.4 Power of condemnation:** When a system or any part thereof is found unsafe to life or property, it shall be condemned and such system shall not be restored to use until it has been made safe and approved.

### SECTION 1103.0 EXISTING BUILDINGS

**1103.1 Unsafe orders:** All existing mechanical equipment and systems shall be maintained and operated in accordance with the requirements of this code and the mechanical code listed in Appendix B. Any such equipment which does not comply with the requirements, and the operation of which is deemed unsafe to the building occupants, shall be altered as ordered by the building official to secure adequate safety.

### SECTION 1104.0 FEES

**1104.1 General:** A permit to begin work for new construction or alteration shall not be issued until the application fee and permit fee prescribed have been paid, nor shall an amendment to a permit necessitating an additional fee because of the additional work involved be issued until the additional fee shall have been paid.

### SECTION 1105.0 BOILER ROOMS

**1105.1 Boiler room:** Every boiler or combination boiler and cooling unit shall be installed in a space which allows a minimum clearance of twenty-four (24) inches on all service sides. Such room shall be constructed of at least one (1) hour fire-resistance rated construction, and the door shall be a Class C fire door or a one and three-quarter (1¾) inch solid wood core door. Such door shall be equipped with an automatic self-closer. Combustion air shall be provided to such room in conformance with the mechanical code listed in Appendix B. Storage or living quarters shall not be permitted in any boiler or similar heating equipment room.

**Exception:** One- and two-family dwellings, except for combustion air requirements as set forth in the mechanical code listed in Appendix B.

**1105.2 Boiler room location:** Boiler rooms shall not be located imme-

diately below exitways; nor shall any space heater, floor furnace or other similar equipment be located in any aisle or passageway used as an element of a required means of egress from the building or structure.

### SECTION 1106.0 DRYING ROOMS

**1106.1 General:** A drying room or dry kiln installed within a building shall be constructed entirely of approved noncombustible materials or assemblies of such materials with the required fireresistance rating based on the fire hazard of the contents and the process as regulated by the approved rules or as required in Article 4 for special uses.

**1106.2 Piping clearance:** All overhead heating pipes shall have a clearance of not less than two (2) inches from combustible contents of the dryer.

**1106.3 Insulation:** When the operating temperature of the dryer is one hundred seventy-five (175) degrees F. or more, metal enclosures shall be insulated from adjacent combustible materials by not less than twelve (12) inches of air space, or the metal walls shall be lined with one-quarter (¼) inch asbestos mill board or other approved equal insulation.

**1106.4 Fire protection:** Drying rooms designed for high hazard materials and processes, including dry cleaning and other special uses provided for in Article 4, shall be protected by approved automatic sprinkler or fog systems, manually controlled steam smothering systems, or other approved fire-extinguishing equipment conforming to the provisions of Article 12 and the mechanical code listed in Appendix B.

### SECTION 1107.0 REFUSE CHUTES

**1107.1 Chute discharge:** A refuse chute shall not feed directly to the combustion chamber of an incinerator, but shall discharge into an enclosed room or bin separated from the incinerator room by ceiling and walls of not less than two (2) hour fireresistance rating, unless otherwise approved by the building official.

**1107.2 Chute enclosures:** Refuse chutes shall be enclosed with walls of masonry of not less than two (2) hour fireresistance rating for interior chutes and of noncombustible (Type 2) construction for exterior chutes. All chutes shall be supported on substantial foundations complying with Article 7.

**1107.3 Chute height:** An interior refuse chute shall extend not less than four (4) feet above the roof and shall be covered with an approved ventilating skylight complying with Section 925.0.

**1107.4 Service compartments:** Service openings for chutes shall be located in separate rooms or compartments enclosed in walls, partitions,

floors and ceilings which have a fireresistance rating of not less than one (1) hour and in which the openings are equipped with fire doors or other approved protectives of not less than three-quarter ( $\frac{3}{4}$ ) hour fireresistance rating or their approved labeled equivalent.

**1107.5 Opening protectives:** All openings between refuse rooms, chutes and incinerator rooms shall be protected with one and one-half ( $1\frac{1}{2}$ ) hour fire doors or their approved labeled equivalent complying with Article 9.

## **SECTION 1108.0 REFUSE VAULTS**

**1108.1 Refuse vault enclosures:** A vault for receiving combustible refuse from an exhaust system shall be constructed of not less than three (3) hour fireresistance rated assemblies.

**1108.2 Openings to boiler rooms:** The opening between a vault and a boiler room shall not exceed nine (9) square feet in area and shall be located at least eight (8) feet from the firing door of the boiler, and the bottom of the opening shall be not less than six (6) inches above the boiler room floor. All openings shall be equipped with approved automatic fire doors of not less than one and one-half ( $1\frac{1}{2}$ ) hour fireresistance rating or the approved labeled equivalent complying with Article 9.

**1108.3 Location:** When located within a building, a refuse vault shall extend above the roof or shall be directly vented to the outer air with ducts complying with Section 1009.0.

**1108.4 Fire protection:** A vault for combustible refuse which exceeds three hundred sixty (360) cubic feet in volume shall be protected by an automatic fire suppression system conforming to Article 12 and the mechanical code listed in Appendix B.

## **SECTION 1109.0 DUST, STOCK AND REFUSE CONVEYOR SYSTEMS**

**1109.1 Power transmission:** Power for fans located in rooms from which flammable dust is being removed shall be transmitted by means of a shaft passing through a bushed hole, or by a belt, chain or similar driving mechanism which is encased in a metal or other noncombustible dust-tight enclosure, both within and without the room.

**1109.2 Collectors and separators:** Cyclone collectors and separators and their supports shall be constructed of noncombustible materials and shall be located whenever possible on the exterior of the building or structure. A collector or separator shall not be located nearer than ten (10) feet to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe which extends above the highest part of any roof within a distance of thirty (30) feet.

**1109.3 Discharge pipes:** Discharge pipes shall conform to all the requirements for ducts, including clearances required for high heat appliances, as contained in the mechanical code listed in Appendix B. A delivery pipe from a cyclone collector shall not convey refuse directly into the fire-box of a boiler, furnace, dutch oven, refuse burner, incinerator or other appliance.

**1109.4 Vents for exhaust conveyor systems:** An exhaust system shall be vented to the outside of the building either directly by flue, or indirectly through the separator, bin, or vault into which it discharges.

**1109.5 Spark protection:** The outlet of an open air vent shall be protected with an approved metal or other noncombustible screen or by other equally efficient means to prevent the entry of sparks.

**1109.6 Explosion relief vents:** A safety or explosion relief vent shall be provided on all systems which convey combustible refuse or stock of an explosive nature, in accordance with the requirements of Article 4.

**1109.6.1 Screens:** When a screen is used in a safety relief vent, it shall be so attached as to permit ready release under emergency pressure.

**1109.6.2 Hoods:** The relief vent shall be provided with an approved noncombustible cowl or hood, or with a counterbalanced relief valve or cover arranged to prevent the escape of hazardous materials, gases or liquids.





# ARTICLE 12

## FIRE PROTECTION SYSTEMS

### SECTION 1200.0 GENERAL

**1200.1 Scope:** The provisions of this article shall specify where fire protection systems are required in all buildings or structures or parts thereof.

**1200.2 Installation requirements:** The installation methods, repair, operation or maintenance of fire protection systems shall be in accordance with this code and the mechanical code listed in Appendix B.

**1200.3 Maintenance:** The owner, tenant or lessee of every building or structure shall be responsible for the care and maintenance of all fire protection systems, including equipment and devices, to insure the safety and welfare of the occupants. Fire protection systems shall not be disconnected or otherwise rendered unserviceable without first notifying the fire department. When installations of required fire protection systems are interrupted for repairs or other necessary reasons, the owner, tenant or lessee shall immediately advise the fire department and shall diligently prosecute the restoration of the protection.

**1200.4 Threads:** All threads provided for fire department connections to sprinkler systems, standpipe systems, yard hydrants or any other fire hose connections shall be uniform to those used by the local fire department.

**1200.5 Signs:** If fire suppression control valves are located in a separate room, or building, a sign shall be provided on the entrance door. The lettering for such sign shall be of a conspicuous color and shall be at least four (4) inches in height and shall read *Sprinkler control valves* and/or *Standpipe control valves* or indicate other types of systems (see Section 1213.8 for additional signs).

**1200.6 Material and equipment:** All materials and equipment used in a fire protection system shall be approved, consistent with the requirements of this code (see Section 108.0) and the standards as listed in Appendices B, C or I.

**1200.7 Tests:** Where required by this article and the standards refer-

enced herein, all flow test connections and points of fluid discharge shall be reasonably accessible and acceptable to the administrative authority.

### SECTION 1201.0 PLANS AND SPECIFICATIONS

**1201.1 Required:** Plans shall be submitted to indicate conformance with this code and the mechanical code of this jurisdiction and shall be reviewed by the department prior to issuance of the permit.

**Note:** Since the fire department is responsible for inspection for the proper maintenance of fire protection systems in buildings, the administrative authority shall cooperate with the fire department in the discharging of his responsibility to enforce this article.

**1201.2 Plans:** The plans and specifications submitted to the department shall contain sufficient detail to evaluate the hazard and to evaluate the effectiveness of the system. The details on the hazards shall include materials involved, the location and arrangement, and the exposure to the hazard.

**1201.3 Calculations:** The details on the fire protection system shall include the design considerations, calculations and other information as required by this code and the mechanical code listed in Appendix B.

### SECTION 1202.0 FIRE SUPPRESSION SYSTEMS

**1202.1 Where required:** Fire suppression systems shall be installed and maintained in full operating condition, as specified in this code, in the following locations except one- and two-family dwellings, indicated in Sections 1202.2 through 1202.18.

**1202.2 Assembly (A-1) use:** In all buildings or portions thereof of A-1 (assembly, theatres) use group.

**Exception:** Auditoriums, foyers, lobbies and toilet rooms.

**1202.3 Assembly (A-2) use:** In all buildings or structures or portions thereof of use group A-2 (assembly, night clubs):

1. when more than five thousand (5,000) square feet in area; or
2. when more than one (1) story in height.

**1202.4 Assembly (A-3) use:** In all buildings or structures or portions thereof of use group A-3 (assembly) when more than twelve thousand (12,000) square feet in area.

**1202.5 Stages in assembly (A) use:** Stages of any size, in assembly occupancies (A) in the following locations:

1. over the stage;
2. stage gridirons when side wall sprinklers with one hundred thirty-five (135) degrees F. rated heads with heat-baffle plates are installed around the entire perimeter of the stage at points not more than

thirty (30) inches below the gridiron, nor more than six (6) inches below the baffle plate;

3. under all fly galleries;
4. over the proscenium opening on the stage side;
5. under the stage;
6. in all basements, cellars, work rooms, dressing rooms, store rooms and property rooms; and
7. in toilet, lounge and smoking rooms.

**1202.6 High hazard (H) use:** In all buildings or structures or portions thereof of use group H (high hazard).

**1202.7 Institutional (I) use:** In all buildings or structures or portions thereof of use group I (institutional).

**Exceptions:**

1. One (1) story hospitals with patient rooms having direct egress to grade level at the exterior of the building.
2. In hospitals of Type I construction, the automatic fire suppression system may be omitted from operating, X-ray rooms, delivery rooms, cardiac and intensive care rooms and patient sleeping rooms not exceeding six-hundred (600) square feet in area when each such room is protected by an automatic fire alarm system connected to a central annunciator panel.
3. One-story day nurseries housing one hundred (100) children or less with each room having an exit directly to the outside.
4. I-1 (institutional-restrained) occupancies having an occupancy load of less than six(6).
5. In I-1 (institutional-restrained) occupancies the fire suppression system shall be a sprinkler system which may be manual or automatic in operation.

**1202.8 Mercantile (M), moderate hazard storage (S-1), or factory and industrial (F) uses:** In all buildings or structures of use groups M, S-1, and F (mercantile, moderate hazard storage or factory and industrial):

1. when more than twelve thousand (12,000) square feet in area; or
2. when more than twenty-four thousand (24,000) square feet in total area on all floors; or
3. when more than three (3) stories in height.

**1202.9 Public garages:** In all public garages:

1. when more than ten thousand (10,000) square feet in area; or
2. when more than seven thousand five hundred (7,500) square feet in area and more than one (1) story in height; or
3. when more than five thousand (5,000) square feet in area, and more than two (2) stories in height; or
4. when more than three (3) stories in height; or

5. when located in buildings where the upper stories are designed for other uses; or
6. when located in any story that is more than fifty (50) per cent below grade.

**Exception:** Open parking structures.

**1202.10 Bus garages:** In all bus garages:

1. when required by Section 1202.9; or
2. when used as passenger terminals for four (4) or more buses; or
3. when used for storage or loading of four (4) or more buses.

**1202.11 Unlimited area buildings:** In "unlimited area buildings" as required by Section 307.0.

**Exception:** Special industrial uses as indicated in Section 205.3.

**1202.12 Storage and workshop areas:** In all portions of use groups A (assembly), B (business), I (institutional) or R-1 and R-2 (residential, hotels and multi-family) occupied for storage, workshop or similar purposes.

**Exception:** Individual storage or work-shop areas located entirely within a dwelling unit.

**1202.13 Story, cellar or basement:** In every story, cellar or basement of all buildings where there is not provided at least twenty (20) square feet of opening entirely above the adjoining grade level in each fifty (50) lineal feet of exterior wall in the story, cellar or basement, on at least two (2) sides of the building. Openings shall have a minimum dimension of not less than twenty-two (22) inches. Such openings shall be unobstructed to allow fire-fighting and rescue operations from the exterior.

**Exception:** If the area of a cellar exceeds two thousand, five hundred (2,500) square feet, an automatic fire suppression system is required.

For purposes of this section, an opening in an exterior wall qualifies as follows:

1. doors or access panels may be included in the determination of openings;
2. windows may be included in the determination of openings if they provide a breakable glazed area of not less than twenty-two (22) inches in its least clear dimension.

**1202.14 Painting rooms:** In spray painting rooms or shops where painting, brushing, dipping, or mixing is regularly conducted using flammable materials.

**1202.15 Trash rooms and chutes:** In rooms or areas used for incineration, trash, laundry collection, or similar uses. At alternate floor levels and at the top of all chutes used in conjunction with these rooms or areas.

**1202.16 Furnace rooms:** In furnace rooms, boiler rooms and rooms for similar uses.

**Exception:** Such room located entirely within and serving a single dwelling unit.

**1202.17 Unenclosed vertical openings:** In unenclosed vertical openings between floors as required by Sections 520.0 and 616.10.

**1202.18 Range hoods:** In range hoods, in accordance with the following requirements listed below.

1. Where natural or liquefied petroleum gas is used as a fuel, a manual reset safety valve shall be installed on the gas service line to prevent fuel from flowing into the burner or pilot in the event of activation of any suppression (extinguishing) system.
2. Hood and duct suppression (extinguishing) systems shall provide for both automatic and manual actuation of the system.
3. A manual station for activation of the suppression (extinguishing) system shall be located at or near one (1) of the means of egress from the area, but not nearer than ten (10) feet to the range hood, unless otherwise specifically approved.
4. The manual station shall be securely mounted not less than four and one-half (4½) feet nor more than five (5) feet above the floor.
5. The system shall be maintained at full operating capacity by the owner or tenant and shall be serviced every six (6) months. A metallic sign with contrasting letters and background shall indicate the manual station of the system and the proper operating (actuation) procedure.
6. All nozzles shall be accessible for cleaning and replacement.
7. CO<sub>2</sub> (carbon dioxide) suppression (extinguishing) systems shall be installed in accordance with the above and Section 1208.6.
8. Dry chemical (approved dry chemical extinguishing media) suppression systems shall be installed in accordance with the above and Section 1210.6.

**1202.19 Alternate protection:** In special use areas of buildings or structures, an automatic fire alarm system may be installed in lieu of a fire suppression system when approved by the building official and fire department and when such fire suppression system installation would be detrimental or dangerous to the specific use or occupancy.

**1202.19.1 Telephone central office equipment buildings:** Within telephone central office equipment buildings, automatic fire sprinklers may be omitted in the following rooms or areas when such rooms or areas are protected with an approved automatic fire alarm system.

1. Generator and transformer rooms.
2. Communication equipment areas when such areas are separated from the remainder of the building by one (1) hour fire-resistance rated wall and two (2) hour fire-resistance rated floor-ceiling assemblies, and are used exclusively for such equipment.

## SECTION 1203.0 SUPPRESSION SYSTEM SELECTION

**1203.1 General:** To guide the administrative authority with the selection of the proper type of fixed fire suppression system, and the extinguishing agent for each type of hazard, fire may be classified as follows.

**Class A** Fires involving ordinary combustible materials (such as wood, cloth, paper, rubber and many plastics) requiring the heat-absorbing (cooling) effects of water, water solutions, or the coating effects of certain dry chemicals which retard combustion.

**Class B** Fires involving flammable or combustible liquids, flammable gases, greases and similar materials where extinguishment is most readily secured by excluding air (oxygen), inhibiting the release of combustible vapors, or interrupting the combustion chain reaction.

**Class C** Fires involving energized electrical equipment where safety to the operator requires the use of electrically nonconductive extinguishing agents.

**Note:** Electrical fires should not be fought with portable Class A or B extinguishers, or with hand-held solid stream nozzle. However, fixed water spray systems may be used to fight fires in energized electrical systems.

**1203.2 Special hazards:** In rooms or buildings containing combustibles, such as aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quick-lime, magnesium powder or sodium peroxide, which are incompatible with the use of water as an extinguishing agent, other extinguishing agents shall be used.

**1203.3 Types:** Where a fire suppression system is required in this code, Table 1203 may be used by the administrative authority to determine the type of suppression system suitable for the hazard involved, if not otherwise specified in this code.

Table 1203  
GUIDE FOR SUPPRESSION SYSTEM SELECTION

Hazard	Water sprinklers or spray 1204.0 to 1206.0	Foam 1207.0	Carbon dioxide or halogenated 1208.0 to 1209.0	Dry chemical 1210.0
Class A fire potential	X	X	X	X
Class B fire potential	X	X	X	X
Class C fire potential	X		X	
<b>SPECIAL FIRE HAZARD AREAS*</b>				
Aircraft hangars	X	X	X	X
Alcohol storage	X	X	X	X
Ammunition loading	X			
Ammunition magazines	X			
Asphalt impregnating	X	X		
Battery rooms			X	
Carburetor overhaul shops	X	X	X	X
Cleaning plant equipment	X	X	X	X

**Table 1203 (cont'd)**  
**GUIDE FOR SUPPRESSION SYSTEM SELECTION**

Hazard	Water sprinklers or spray 1204.0 to 1206.0	Foam 1207.0	Carbon dioxide or halogenated 1208.0 to 1209.0	Dry chemical 1210.0
Computer rooms	X		X	
Dowtherm	X			
Drying ovens	X		X	X
Engine test cells	X	X	X	
Escalator, stair wells	X			
Explosives: manufacturing, storage	X			
Flammable liquids storage	X	X	X	
Flammable solids storage	X			
Fuel oil storage	X	X		
Hangar decks	X	X		
Hydraulic oil, lubricating oil	X		X	
Hydro-turbine generators	X		X	
Jet engine test cells	X	X	X	
Library stacks	X		X	
Lignite storage and handling	X			
Liquefied petroleum gas storage	X			
Oil quenching bath	X	X	X	X
Paints: manufacturing, storage	X	X	X	X
Paint spray booths	X		X	X
Petrochemical storage	X	X	X	
Petroleum testing laboratories	X	X	X	
Printing presses	X		X	
Range hoods	X		X	X
Reactor and fractionating towers	X			
Record vaults			X	
Rubber mixing and heat treating	X			
Service stations (inside buildings)	X		X	
Shipboard storage	X		X	
Solvent cleaning tanks		X	X	X
Solvent thinned coatings		X	X	X
Switchgear rooms			X	
Transformers, circuit breakers (outdoors)	X			
Transformers, circuit breakers (indoors)	X		X	
Turbine lubricating oil	X	X	X	X
Vegetable oil, solvent extraction	X	X		

\*Within buildings or areas, so classified, as to require a suppression system.

**1203.4 Installation:** Fixed fire suppression systems shall be of an approved type designed and installed in accordance with the requirements of this code.

**1203.5 Tests:** All tests required by this code and the standards listed in Appendix B shall be conducted at the expense of the owner or his representative.

## SECTION 1204.0 WATER SPRINKLER SYSTEMS

**1204.1 General:** Water sprinkler extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and the standards listed in Appendices B or I.

**1204.2 Occupancy sprinkler system:** Within a building of mixed occupancies and where an occupancy is required by this code to be sprinklered with more than twenty (20) sprinklers, the area shall be enclosed by construction assemblies as required by this code and equipped with a complete sprinkler system.

**1204.3 Design:** The details on the system supplied with the plans and specifications shall include information and the calculations on the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

**1204.4 Actuation:** Water sprinkler extinguishing systems shall be automatically actuated unless otherwise specifically provided in this code.

**1204.5 Sprinkler alarms:** Approved audible or visual alarm devices shall be connected to every water sprinkler system and such alarm device shall be located in an approved location.

**Exception:** Alarms and alarm attachments shall not be required for limited area sprinkler systems (see Section 1205.5).

**1204.5.1 Additional alarms:** At least one (1) additional audible or visual alarm device shall be installed within the building.

**1204.6 Water control valve tags:** Identification tags shall be provided in accordance with the standards listed in Appendix I.

**1204.7 Sprinkler riser:** The sprinkler system riser(s) may also serve as the wet standpipe riser(s) in buildings required to have both systems or in buildings having both systems (see Section 1211.4.1).

**1204.8 Tests:** A completed system shall be tested hydrostatically for two (2) hours without visible leakage at not less than two hundred (200) pounds per square inch (psi), or at fifty (50) psi in excess of the maximum static pressure when the maximum static pressure is in excess of one hundred and fifty (150) psi.

## SECTION 1205.0 LIMITED AREA SPRINKLER SYSTEMS

**1205.1 General:** A limited area sprinkler system shall be of an approved type and installed in accordance with the provisions of this code and the standards listed in Appendices B or I.

**1205.2 Installation:** Where the provisions of this code require a limited



number of sprinklers, a limited area sprinkler system may be installed to comply with these requirements.

**1205.3 Design:** The detail on the system supplied with the plans and specifications shall include information and the calculations on the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

**1205.4 Actuation:** A limited area sprinkler extinguishing system shall be automatically activated.

**1205.5 Sprinkler alarms:** Alarms and alarm attachments shall not be required.

**1205.6 Water supply:** Limited area sprinklers may be supplied from the domestic water system provided the domestic water system is designed to adequately support the design flow of the largest number of sprinklers in any one (1) of the enclosed areas. When supplied by the domestic water system, the maximum number of sprinklers in any one (1) enclosed room or area shall not exceed twenty (20) sprinklers which must totally protect the room or area.

**1205.6.1 Fire department connections:** A fire department connection is not required for limited area sprinkler systems supplied from the domestic water system.

**1205.6.2 Standpipe connection:** The water supply for the limited area sprinkler system shall be from the building standpipe system when available (see Section 1211.4.1).

**1205.6.3 Cross connection:** A limited area sprinkler system may be supplied individually from the domestic water system or from the standpipe system. There shall not be a cross-connection between the domestic and standpipe system.

**1205.7 Use:** Limited area sprinklers shall be used only in rooms or areas enclosed with construction assemblies as required by this code.

## SECTION 1206.0 WATER SPRAY FIXED SYSTEMS

**1206.1 General:** Water spray extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFPA 15 listed in Appendix I.

**1206.2 Design:** The detail on the system supplied with the plans and specifications shall include information and the calculations on the sprinkler spacing and arrangement with water supply and discharge requirements, size and equivalent lengths of pipe and fittings and water supply source. Sufficient information shall be included to identify the apparatus and devices used.

**1206.3 Actuation:** Waterspray extinguishing systems shall be the automatically actuated type with supplementary auxiliary manual tripping capability.

**1206.4 Tests:** All new system piping shall be hydrostatically tested in accordance with the provisions of the standard referenced above.

### SECTION 1207.0 FOAM EXTINGUISHING SYSTEMS

**1207.1 General:** Foam extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFPA 11, 11A and 16 listed in Appendix I.

**1207.2 Design:** The detail on the system supplied with the plans and specifications shall include complete computations showing pressure drop in all system piping, friction loss calculations on liquid lines and a detailed layout of the entire hazard to be protected. Hydraulic characteristics of foam proportioners and foam makers as determined by tests shall be supplied by the manufacturer to the department (including the range of operating conditions required for the proposed installation), to permit determination of the adequacy of the hydraulics of the proposed protection.

**1207.3 Actuation:** A foam extinguishing system shall be automatically actuated with supplementary auxiliary manual tripping capability.

**1207.4 Tests:** All piping except that piping which handles expanded foam shall be subjected to a two (2) hour hydrostatic pressure test at two hundred (200) psi or fifty (50) pounds in excess of the maximum pressure anticipated, whichever is greater without leakage. The system shall be subjected to a flow test to insure that the hazard is fully protected in conformance with the design specification, and to determine the flow pressures, actual discharge capacity, foam quality, consumption rate of foam-producing materials, manpower requirements and other operating characteristics.

### SECTION 1208.0 CARBON DIOXIDE EXTINGUISHING SYSTEMS

**1208.1 General:** Carbon dioxide extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFPA 12 listed in Appendix I.

**1208.2 Design:** The detail on the system supplied with the plans and specifications shall include information and calculations on the amount of carbon dioxide; the location and flow rate of each nozzle including equivalent orifice area; the location, size and the carbon dioxide storage facility. Information shall be submitted pertaining to the location and function of the detection devices, operating devices, auxiliary equipment, and electrical circuitry, if used. Sufficient information shall be indicated to identify

properly the apparatus and devices used. Any special features should be adequately explained.

**1208.3 Actuation:** Carbon dioxide extinguishing systems shall be automatically actuated with supplementary auxiliary manual tripping capability.

**1208.4 Safety requirements:** In any proposed use of carbon dioxide where there is a possibility that men may be trapped in, or enter into atmospheres made hazardous by a carbon dioxide discharge, warning signs, discharge alarms and breathing apparatus shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres and also to provide means for prompt rescue of any trapped personnel.

**1208.5 Tests:** A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests should be conducted on all devices except cylinder valves in multi-cylinder high pressure systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge and analysis test should be made. All tests are to be conducted as indicated in the above standard.

**1208.6 Range hoods:** In addition to the above requirements and the requirements of Section 1202.18, range hood CO<sub>2</sub> systems shall conform to the following requirements listed below.

1. Where multiple hoods are served, each hood shall be provided with a separate manual station (actuator) and a separate CO<sub>2</sub> supply.
2. Total CO<sub>2</sub> requirements shall be calculated on the following accumulative basis:
  - a. open area of hood (sq. ft.)  $\div$  0.6 = pounds of CO<sub>2</sub>;
  - b. volume of hood (cu. ft.) (minimum depth of two feet)  $\div$  8.0 = pounds of CO<sub>2</sub>;
  - c. hoods located over liquid surface operations; liquid surface area (sq. ft.)  $\div$  0.4 = lbs. CO<sub>2</sub> (10 lbs. minimum);
  - d. volume of plenum (cu. ft.)  $\div$  8.0 = lbs. of CO<sub>2</sub>;
  - e. volume of duct of fire damper (cu. ft.)  $\div$  8.0 = lbs. of CO<sub>2</sub>;
  - f. duct above fire damper, minimum 10 lbs. CO<sub>2</sub>; and
  - g. in addition to the calculations, an additional 10 lbs. of CO<sub>2</sub> shall be provided as a safety factor.
3. Upon activation of the CO<sub>2</sub> system, the fan(s) shall cease to operate and the supply valve shall shut the pilot and burner(s) off.
4. Duct systems from range hoods shall not be equipped with fire dampers unless specifically approved for such use, or are required as part of an approved extinguishing system, or an approved fan bypass system.
5. CO<sub>2</sub> bottles shall be located at least fifteen (15) feet from the range

or range hood. The temperature in the storage area shall not exceed one hundred twenty (120) degrees F. or be less than thirty-two (32) degrees F.

6. An electric warning light of ten (10) watts or more shall be provided on the CO<sub>2</sub> bottle or system which will automatically illuminate when the bottle or system is depleted. The light shall be of a distinctive red color and shall be located in a conspicuous location.

### **SECTION 1209.0 HALOGENATED FIRE EXTINGUISHING SYSTEMS**

**1209.1 General:** Halogenated fire extinguishing systems shall be of an approved type and installed in accordance with the provisions of this code and NFPA 12A and 12B listed in Appendix I.

**1209.2 Design:** The detail on the system supplied with the plan and specifications shall include information and calculations of the amount of extinguishing agent; container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; the location, size and equivalent lengths of pipe, fittings and hose; and the location and size of the storage facility. Information shall be submitted pertaining to the location and size of the storage facility. Information shall be submitted pertaining to the location and function of the detection devices, auxiliary equipment, and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features should be adequately explained.

**1209.3 Actuation:** Halogenated fire extinguishing systems shall be automatically actuated with supplementary auxiliary manual tripping capability.

**1209.4 Safety requirements:** In any proposed use of a halogenated fire extinguishing system where there is a possibility that men may be trapped in or enter into atmospheres made hazardous by a discharge, warning signs, discharge alarms and breathing apparatus shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres and also to provide means for prompt rescue of any trapped personnel.

**1209.5 Tests:** A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests should be conducted on all devices except cylinder valves in multi-cylinder systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test or concentration analysis should be made. All tests are to be conducted as indicated in the above standard.

### **SECTION 1210.0 DRY CHEMICAL EXTINGUISHING SYSTEMS**

**1210.1 General:** Dry chemical extinguishing systems shall be of an

approved type and installed in accordance with the provisions of this code and NFPA 17 listed in Appendix I.

**1210.2 Design:** The details on the system supplied with the plans and specifications shall include sufficient information and calculations on the amount of dry chemical; the size, length, and arrangement of connected piping, or piping and hose; description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features should be adequately explained.

**1210.3 Actuation:** A dry chemical extinguishing system shall be automatically actuated with supplementary auxiliary manual tripping capability.

**1210.4 Safety requirements:** Where there is a possibility that personnel may be exposed to a dry chemical discharge, warning signs, discharge alarms and breathing apparatus shall be provided to ensure prompt evacuation of such locations, and also to provide means for prompt rescue of any trapped personnel.

**1210.5 Tests:** A completed system shall be tested by a discharge of expellant gas through the piping and nozzles. Observations for serious gas leakage and for continuity of piping with free unobstructed flow shall be made. Observations shall be made of the flow of expellant gas through all nozzles. The labeling of devices with proper designations and instructions should be checked. After testing, all piping and nozzles are to be blown clean, using compressed air or nitrogen and the system properly charged and placed in the normal "set" condition. All tests are to be conducted as indicated in the above standard.

**1210.6 Range hoods:** In addition to the above requirements and the requirements of Section 1202.18, range hood dry chemical systems shall conform to the following requirements listed below.

1. Dry chemical systems shall bear the label of a nationally recognized testing or inspection agency and shall be installed in accordance with their recommendations and shall be approved by the department and fire department.
2. The size of hood and duct covered by a single system shall not exceed the agency's recommendations.
3. Dry chemical agent used shall be non-toxic.
4. Multiple hoods may be protected by a common system if in conformance with a report of a nationally recognized testing or inspection agency.
5. Each duct system shall constitute an individual system serving only exhaust hoods on one (1) floor.

6. Dry chemical containers may be located either on the cooking equipment stand or at a location remote from the range or range hood, but consistent with the dry chemical supply line distance limitations listed by a nationally recognized testing or inspection agency or as approved by the department and fire department.
7. A hand portable fire extinguisher shall be installed in the cooking area and shall have a rating of at least twenty (20) BC and be located not more than fifteen (15) feet and not less than (10) feet from the hazard. Dry chemical type extinguishers shall be of the alkaline type. Acidic base extinguishing materials such as multi-purpose dry chemical impede saponification; therefore, if cooking equipment being protected involves exposed liquified fat or oil in depth such as fryers, extinguishers employing acidic base materials are not recommended.

## SECTION 1211.0 STANDPIPE SYSTEMS

**1211.1 General:** All buildings and structures shall be equipped with two and one-half (2½) inch or larger standpipes, and shall be made to comply with the requirements of this section.

**1211.2 Where required:** Standpipes shall be installed and maintained in full operating condition, as specified in this article and the standards listed in Appendix I, in the locations described in Sections 1211.2.1 through 1211.2.3.

**1211.2.1 Assembly (A-1, A-2 or A-3):** In buildings two (2) or more stories in height of use group A-1, A-2, or A-3 (assembly) with an occupancy load of more than three hundred (300).

**1211.2.2 Three stories:** In buildings three (3) stories in height when:

1. of use groups B (business), F (factory and industrial), M (mercantile) or S-1 (moderate hazard storage) more than three thousand (3,000) square feet in area per floor; or
2. of use groups A (assembly), I (institutional), or R-1 (residential, hotels); or
3. of any use group more than ten thousand (10,000) square feet in area per floor.

**1211.2.3 Four stories:** In buildings four (4) stories or more in height regardless of the area per floor.

**1211.2.4 Public garages:** In all public garages:

1. when more than ten thousand (10,000) square feet in area; or
2. when more than seven thousand five hundred (7,500) square feet in area and more than one (1) story in height; or
3. when more than five thousand (5,000) square feet in area, and more than two (2) stories in height; or
4. when more than three (3) stories in height; or

5. when located in buildings where the upper stories are designed for other uses; or
6. when located in any story that is more than fifty (50) per cent below grade.

**1211.3 Sizes:** Standpipes shall extend from the lowest portion of the building to a height five (5) feet above the finished floor of the topmost story and shall have a minimum diameter as described in the following Table 1211.

**Table 1211**  
**BUILDING HEIGHT AND STANDPIPE SIZE**

Maximum building height	Minimum standpipe size**
3 stories or 40 feet	2½ inches
4 stories or 50 feet	2½ inches
5 stories or 65 feet	4 inches
6 stories or 75 feet	4 inches
7* stories or 85 feet	6 inches
8* stories or 95 feet	6 inches
95* feet to 250 feet	6 inches
over 250* feet	8 inches

\*At least one (1) standpipe shall extend through the roof and terminate in a two-way, two and one-half (2½) inch hose connection.

\*\*In sprinklered buildings, the minimum standpipe diameter may be based on hydraulic calculations.

**1211.4 Number of risers:** The number of standpipe risers shall be such that all parts of every floor area can be reached by a thirty (30) foot hose stream from a nozzle attached to not more than one hundred (100) feet of hose connected to a riser outlet. In those buildings equipped with an interior smokeproof enclosure vestibule, at least one standpipe hose connection shall be located in the vestibule.

**1211.4.1 Combination:** The standpipe system riser(s) may also serve as the water sprinkler system riser(s) in buildings required to have both systems or in buildings having both systems. A control valve shall be installed in each sprinkler system or standpipe to allow the system to remain operational.

### **1211.5 Outlets**

**1211.5.1 Hose connections:** At each floor level, and not more than five (5) feet above the floor, there shall be connected to each standpipe a two and one-half (2½) inch hose connection and a one and one-half (1½) inch hose connection with valves and threads conforming to the local fire department's standard. Each one and one-half (1½) inch hose connection shall be equipped with not more than one hundred (100) feet of one and one-half (1½) inch approved lined fire hose with an approved variable fog nozzle and couplings and hung in an approved rack or cabinet. Hose provided for rack and cabinet use shall be of ozone resistant material and designed to be folded in a pin rack unit.



**Exception:** In sprinklered buildings, the one and one-half (1½) inch hose connection, hose and cabinet are not required.

**1211.5.2 Roof hydrant:** Where standpipes extend through the roof, an approved hydrant or manifold shall be provided. The main control valve on a roof hydrant or manifold shall be located in an area not subject to freezing, as close to the roof access as practical and plainly marked (see Section 1213.0).

**1211.6 Material:** All standpipes shall be constructed of approved materials. All pipe, fittings and valves shall be of extra heavy pattern when the working pressure will exceed one hundred seventy-five (175) psi.

**1211.7 Capacity:** Each standpipe shall be sized for a minimum flow of five hundred (500) gallons per minute. Where only one standpipe is required, its supply piping shall be sized for a minimum flow of five hundred (500) gallons per minute. Where more than one standpipe is required, all common supply piping shall be sized for a minimum flow of five hundred (500) gallons per minute for the first standpipe plus two hundred fifty (250) gallons per minute for each additional standpipe, the total not to exceed twenty five hundred (2500) gallons per minute. The supply shall be sufficient to maintain a residual pressure of sixty-five (65) pounds per square inch at the topmost outlet of each standpipe with five hundred (500) gallons per minute flowing.

## SECTION 1212.0

### STANDPIPES FOR BUILDINGS UNDER CONSTRUCTION OR DEMOLITION

**1212.1 General:** Standpipes required by this section may be temporary or permanent in nature, with or without a water supply, provided, however, that such standpipes shall remain in service until completion of the work.

**1212.2 Number required:** Every building or structure under construction five (5) or more stories in height above grade, shall be equipped with one (1) or more standpipes at least four (4) inches in diameter. A sufficient number of standpipes with hose(s) shall be provided so that every portion of the building can be reached with one hundred (100) feet of hose and a thirty (30) foot hose stream.

**1212.3 Construction:** All standpipes shall be constructed of approved materials. All pipe, fittings and valves shall be extra heavy pattern when the working pressure exceeds one hundred seventy-five (175) psi.

**1212.4 Height:** The standpipe systems shall be carried up with each floor and shall be installed and ready for use as each floor progresses. Standpipes shall not be more than one (1) floor below the highest forms or staging.

**1212.5 Fire department connections:** At the street level there shall be provided for each temporary or permanent standpipe installation one (1) or more two (2) way fire department inlet connections. Fire department inlet



connections shall be prominently marked and readily and easily accessible at all times (see Section 1213.8).

**1212.6 Outlets:** At each floor level and on each standpipe, there shall be provided one (1) two and one-half (2½) inch hose outlet and one (1) two and one-half (2½) inch hose valve with cap and chain. At each floor level and on each standpipe, there shall be provided a one and one-half (1½) inch hose outlet with one hundred (100) feet of approved hose. Outlets shall be located not more than five (5) feet above floor level.

**Exception:** In sprinklered buildings, the one and one-half (1½) inch outlet is not required, however, the one and one-half (1½) hose line shall be provided with a one and one-half (1½) to two and one-half (2½) reducer (see Section 1211.5.1).

**1212.7 Buildings under demolition:** Where a building is being demolished and a standpipe is existing within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building, but the standpipe shall not be more than one (1) floor below the floor above being demolished.

## SECTION 1213.0 FIRE DEPARTMENT CONNECTIONS

(See Section 1212.5 for temporary standpipes)

**1213.1 Required:** All water sprinkler and standpipe systems shall be provided with at least one (1) two (2) way fire department connection. Each inlet of the fire department connection shall be at least two and one-half (2½) inches in diameter. The pipe from the standpipe system to the fire department connection shall not be smaller than four (4) inches. The pipe from the water sprinkler system to the fire department connection shall not be smaller than four (4) inches. Single fire department connections may be installed when approved by the department.

**Exception:** A fire department connection shall not be required for limited area sprinkler systems (see Section 1205.6.1).

**1213.2 Connections:** Fire department connections shall be arranged in such a manner that the use of any one (1) water sprinkler connection will serve all the sprinklers, and the use of any one (1) standpipe connection will serve all the standpipes within the building.

**1213.3 Location:** Fire department connections shall be located and be visible on a street front or in a location approved by the department. Such connections shall be located so that immediate access can be made by the fire department. Obstructions such as fences, bushes, trees, walls or any other similar object shall not be permitted for new or existing installations.

**1213.4 Height:** Fire department connections shall not be less than one (1) foot six (6) inches and not more than three (3) feet six (6) inches in elevation, measured from the ground level to the center line of the inlets.

**1213.5 Projection:** Where the fire department connection would project beyond the property line or into the public way, a flush-type fire department connection shall be provided.

**1213.6 Hose threads:** Hose threads in the fire department connection shall be uniform with that used by the local fire department.

**1213.7 Fittings:** Fire department inlet connections shall be fitted with check valves, ball-drip valves, and caps and chains.

**1213.8 Signs:** A metal sign with raised letters at least one (1) inch in height shall be mounted on all fire department connections serving sprinklers and/or standpipes. Such signs shall read *Automatic sprinklers* and/or *Standpipe*.

## **SECTION 1214.0 WATER SUPPLY AND OTHER EXTINGUISHING SUPPLY MEDIA**

**1214.1 Required:** All fire suppression and standpipe systems shall be provided with at least one (1) automatic supply of extinguishing material of adequate pressure, capacity and reliability to perform the function intended.

**1214.2 Combination "sprinkler-standpipe" water supply:** Where both sprinklers and standpipes are installed, they may have a common fire water service as their combined source of supply. The connection shall not be made to any water main of this jurisdiction of less than four (4) inches in diameter. In sprinklered buildings with combined standpipes, the water supply shall be adequate for the sprinkler system or the standpipe system, whichever is greater.

**1214.3 Combination "sprinkler-domestic" water supply:** A sprinkler system may be connected to the domestic water supply system as allowed by this code, provided the supply system is of adequate pressure, capacity and size for the simultaneous operation of the water sprinkler system and domestic water needs. A check valve shall be installed in the water sprinkler supply line to prevent contamination of the domestic water.

**1214.4 Size:** The extinguishing material supply for fire suppression systems shall be sized in an approved manner in accordance with this code and the standards listed in Appendix I.

### **1214.5 Standpipes**

**1214.5.1 Water service:** Standpipes shall be connected to a street water main with a fire water service at least equal to the size of the largest standpipe within the building, or shall be hydraulically calculated to satisfy total demand. The size of the water service at the base of the standpipe risers shall be at least the size of the largest standpipe.

**1214.5.2 Interconnection:** The required water supply shall be connected to the base of each standpipe. Where more than one (1) standpipe is required, all standpipes shall be interconnected at their base and an approved indicating valve shall be installed at the base of each standpipe

so as to permit individual risers to be taken out of service if damaged or broken without interrupting the water supply to other risers.

### SECTION 1215.0 YARD HYDRANTS

**1215.1 Fire hydrants:** Fire hydrants installed on private property shall be located and installed as directed by the fire department. Hydrants shall conform to the standards of the administrative authority of this jurisdiction and the fire department. Hydrants shall not be installed on a water main of less than six (6) inches in diameter.

### SECTION 1216.0 AUTOMATIC FIRE ALARM SYSTEMS

**1216.1 Plans and specifications:** Where required by this code, the plans and specifications for the automatic fire alarm system shall show location and number of all sending station and signals with specifications of the type, construction, and operation of the system including all automatic detection devices. Installation of all equipment shall conform to the requirements of this code and the applicable standards listed in Appendix I.

**1216.2 Approval:** The automatic fire alarm system shall be approved for the particular application and shall only be used for detection and signaling in the event of fire. The automatic detecting devices shall be approved smoke detectors.

**1216.3 Where required:** An automatic fire alarm system shall be installed and maintained in full operating condition in the locations described in the following Sections 1216.3.1 through 1216.3.3.

**1216.3.1 Institutional (I) use:** In all buildings of use group I (institutional).

**1216.3.2 Residential (R-1) use:** In all buildings of use group R-1 (residential, hotels).

**Exception:** Buildings over six (6) stories or seventy-five (75) feet in height equipped with an automatic fire suppression system.

**1216.3.3 Residential use:** In each guest room, suite or sleeping area of use group R-1 (residential, hotel, motel, lodging house, boarding house and dormitory), dwelling unit within buildings of use groups R-2 (residential, multi-family) or R-3 (residential, one- and two-family) and R-4 (detached one- and two-family). Each dwelling unit shall be provided with a minimum of one (1) approved smoke detector installed in a manner and location approved by the authority having jurisdiction. When actuated, the detector shall provide an alarm suitable to warn the occupants within the individual dwelling unit (see Section 1217.3.1).

In buildings having basements or cellars an additional smoke detector shall be installed in the basement or cellar in a location approved by

the authority having jurisdiction. Smoke detectors required by this section shall comply with the standard listed in Appendix I.

**1216.4 Sprinklered buildings exception:** Buildings or portions thereof equipped with an automatic fire suppression system are not required to be equipped with an automatic fire alarm system but are required to be equipped with a manual fire alarm system conforming to Section 1217.0.

**1216.5 Manual pull stations:** A manual fire alarm system conforming to the requirements of Section 1217.0 shall be installed in conjunction with an automatic fire alarm system.

**Exception:** Automatic fire alarm system for use groups R-2 and R-3 as required by Section 1216.3.3.

**1216.6 Distances:** Approved fire detecting devices shall be installed not to exceed the lineal or square footage allowances specified, based on the generally accepted test standards under which they were tested and approved.

**1216.7 Not mandatory:** In special use buildings and structures or parts thereof, an automatic fire alarm system may be installed in lieu of an automatic fire suppression system when approved by the department and fire department when such installation would be detrimental or dangerous to the specific use and occupancy (see Section 1202.19).

**1216.8 Power supply:** The power for the automatic fire alarm system shall be provided from an emergency electrical system.

**Exception:** Automatic fire alarm systems for use groups R-2 and R-3 as required by Section 1216.3.3.

**1216.9 Requirements:** All automatic fire alarm systems shall be of the closed circuit type and shall be electrically or mechanically supervised. In addition, such systems shall comply with the following Sections 1216.9.1 through 1216.9.3.

**1216.9.1 Wiring:** All wiring shall conform to the requirements of NFPA 72 as listed in Appendix I.

**1216.9.2 Audible alarms:** Audible alarms, of approved type, shall be provided. The operation of any detection device shall cause all audible or visual alarms to operate. Visual and audible alarms shall be provided in occupancies housing the hard-of-hearing. Alarm-sounding devices shall be of an approved type, shall provide a distinctive tone and shall not be used for any other purpose than that of a fire alarm. They shall be located so as to be effectively heard above all other sounds, by all the occupants, in every occupied space within the building.

**1216.9.3 Zones:** Each floor shall be zoned separately. If the floor area exceeds twenty thousand (20,000) square feet, additional zoning shall be provided. The length of any zone shall not exceed two hundred (200)

feet in any direction. Zoning indicator panels and controls shall be located as approved by the department. Annunciators shall lock in until the system is reset.

**1216.10 Fire alarm acceptance tests:** Upon completion of a fire alarm system, the installation shall be subjected to a performance test to demonstrate its efficiency of operation. Also, all connections and wiring, with signal devices disconnected shall develop an insulation resistance of not less than one (1) megohm.

## SECTION 1217.0 MANUAL FIRE ALARM SYSTEMS (PULL STATIONS)

**1217.1 Plans and specifications:** Where required by this code, the plans and specifications for the manual fire alarm system shall show the location and number of all sending stations and signals with specifications of the type, construction and operation of the system. Installation of all equipment shall conform to the requirements of this code and the applicable standards listed in Appendix I.

**1217.2 Approval:** The manual fire alarm system shall be approved for the particular application and shall be used for the fire protection signaling purposes only. Alarm boxes shall be painted a distinctive red color.

**1217.3 Where required:** A manual fire alarm system shall be installed and maintained in full operating condition in the locations described in the following Sections 1217.3.1 through 1217.3.4.

**1217.3.1 Automatic alarm system:** In all buildings required to be equipped with an automatic fire alarm system (see Section 1216.5).

**Exception:** Automatic fire alarm system as required by Section 1217.3.3 for dwelling units in use groups R-2 and R-3.

**1217.3.2 Assembly (A-4) use:** In all new and existing buildings of use group A-4 (assembly, educational).

**Exception:** Sanctuary and nave areas of churches and similar religious buildings.

**1217.3.3 Business (B) use:** In all buildings of use group B (business) when three (3) or more stories in height.

**Exception:** Buildings equipped with an automatic fire suppression system and less than seven (7) stories in height.

**1217.3.4 Residential (R-2) use:** In all buildings of use group R-2 (residential, multi-family) when four (4) or more stories in height.

**1217.4 Location:** Manual pull stations shall be located in each common corridor of each story including basements or cellars, so that from each common corridor door, not more than two hundred (200) feet will be traversed in order to reach a manual station. Stations shall be located as near as possible and not more than five (5) feet from each exitway. Where

corridors are not provided, manual stations shall be located so that any point in the building is not more than two hundred (200) feet from a station. Where a stage is provided, a manual pull station shall be located adjacent to the lighting control panel.

**1217.5 Coding:** Coded stations shall be coded in conformance with the standards as listed in Appendix I.

**1217.6 Power supply:** The power for the fire alarm system shall be provided from an emergency electrical system.

**1217.7 Requirements:** Fire alarm systems shall be of the closed circuit type and shall be electrically or mechanically supervised. In addition, such systems shall comply with the following Sections 1217.7.1 through 1217.7.5.

**1217.7.1 Wiring:** All wiring shall conform to the requirements of NFPA 72 as listed in Appendix I.

**1217.7.2 Alarms:** Audible alarms, of the approved type, shall be provided. In institutional occupancies, audible and visual alarms shall be provided. The operation of any fire alarm device shall cause all audible or visual alarms to operate. Visual and audible alarms shall be provided in occupancies housing the hard-of hearing. Alarm sounding devices shall be of approved type, shall provide a distinctive tone and shall not be used for any other purpose than that of an alarm of fire. They shall be of such character and so located as to be effectively heard above all other sounds (or seen), by all the occupants, in every occupied space within the building.

**1217.7.3 Pre-signal system:** A pre-signal system may be installed in institutional occupancies. Pre-signal systems shall not be installed in other occupancies, unless approved by the department and by the fire department. Where a pre-signal system is installed, twenty-four (24) hour personnel supervision shall be provided at a location approved by the fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

**1217.7.4 Box height:** The height of the manual pull station boxes shall be not more than four (4) feet, measured vertically from the floor level.

**1217.7.5 Zones:** Each floor shall be zoned separately. If the floor area exceeds twenty-thousand (20,000) square feet, additional zoning shall be provided. The length of any zone shall not exceed two hundred (200) feet in any direction. Zoning indicator panels and controls shall be located as approved by the department. Annunciators shall lock in until the system is reset.

**1217.8 Acceptance tests:** Upon completion of a fire alarm system, the installation shall be subjected to a performance test to demonstrate its efficiency of operation. Also, all connections and wiring, with signal devices disconnected shall develop an insulation resistance of not less than one (1) megohm.

**SECTION 1218.0 SUPERVISION**

**1218.1 Fire suppression systems:** Valves controlling required fire suppression systems shall be supervised open by one (1) of the following methods:

1. approved central station system, proprietary system or remote station system of the jurisdiction;
2. local alarm service which will cause the sounding of an audible signal at a constantly attended location;
3. locking valves open; or
4. sealing of valves and approved weekly recorded inspection when valves are located within fenced enclosures under the control of the owner.

**Exceptions**

1. Underground gate valves with roadway boxes.
2. Halogenated extinguishing systems.
3. Carbon dioxide extinguishing systems.
4. Dry chemical extinguishing systems.

**1218.2 Fire protection systems:** All required fire protection systems shall be connected to an approved central station system, proprietary system, or remote station system of the jurisdiction, when approved by the fire department.

**Exceptions**

1. Fire suppression systems shall conform to Section 1218.1.
2. Standpipe systems.
3. Fire alarm systems in residential occupancies (use group R) when less than five (5) stories in height.
4. Automatic fire alarm devices protecting individual dwelling units as required by Section 1216.3.3.





# **ARTICLE 13**

## **PRECAUTIONS DURING BUILDING OPERATIONS**

### **SECTION 1300.0 GENERAL**

**1300.1 Scope:** The provisions of this article shall apply to all construction operations in connection with the erection, alteration, repair, removal or demolition of buildings and structures. The execution of the detail requirements shall be regulated by the approved rules and the safety codes for building construction listed in Appendix B.

**1300.2 Other laws:** Nothing herein contained shall be construed to nullify any rules, regulations or statutes of state agencies governing the protection of the public or workmen from health or other hazards involved in manufacturing, mining and other processes and operations which generate toxic gases, dust or other elements dangerous to the respiratory system, eyesight or health.

**1300.3 Combustible and explosive hazards:** The provisions of this code which apply to the storage, use or transportation of explosives, highly flammable and combustible substances, gases and chemicals shall be construed as supplemental to the requirements of the federal laws, the regulations of the Department of Transportation (DOT) and the rules and regulations of the jurisdiction.

### **SECTION 1301.0 PLANS, SPECIFICATIONS AND SPECIAL PERMITS**

**1301.1 Temporary construction:** Before any construction operation is started, plans and specifications shall be filed with the building official showing the design and construction of all sidewalk sheds, truck runways, trestles, foot bridges, guard fences and other similar devices required in the operation; and the approval of the building official shall be secured before the commencement of any work.

**1301.2 Special permits:** All special licenses and permits for the storage of materials on sidewalks and highways, for the use of water or other public facilities and for the storage and handling of explosives shall be secured from the administrative authorities having jurisdiction.

**1301.3 Temporary encroachments:** Subject to the approval of the building official, sidewalk sheds, underpinning and other temporary protective guards and devices may project beyond the interior and street lot lines as may be required to insure the safety of the adjoining property and the public. When necessary, the consent of the adjoining property owner shall be obtained.

### SECTION 1302.0 TESTS

**1302.1 Loading:** It shall be unlawful to load any structure, temporary support, scaffolding, sidewalk bridge or sidewalk shed or any other device or construction equipment during the construction or demolition of any building or structure in excess of its safe working capacity as provided in Article 7 for allowable loads and working stresses.

**1302.2 Unsafe equipment:** Whenever any doubt arises as to the structural quality or strength of scaffolding plank or other construction equipment, such material shall be replaced; provided, however, the building official may accept a strength test to two and one-half (2½) times the superimposed live load to which the material or structural member is to be subjected. The member shall sustain the test load without failure.

### SECTION 1303.0 INSPECTION

**1303.1 Unsafe conditions:** When inspection of any construction operation reveals that any unsafe or illegal conditions exist, the building official shall notify the owner and direct him to take the necessary remedial measures to remove the hazard or violation.

**1303.2 Failure to comply with orders:** Unless the owner so notified proceeds to comply with the orders of the building official within twenty-four (24) hours, the building official shall have full power to correct the unsafe conditions as provided in Sections 124.0 and 125.0. All expenses incurred in the correction of such unsafe conditions shall become a lien on the property.

**1303.3 Unsafe construction equipment:** When the strength and adequacy of any scaffold or other device or construction equipment is in doubt, or when any complaint is made, the building official shall inspect such equipment and shall prohibit its use until tested as required in Section 1302.2 or until all danger is removed.

### SECTION 1304.0 MAINTENANCE

**1304.1 General:** All construction equipment and safeguards shall be constructed, installed and maintained in a substantial manner and shall be so operated as to insure protection to the workmen engaged thereon and to the general public. It shall be unlawful to remove or render inoperative

any structural, fire-protective or sanitary safeguard or device herein required except when necessary for the actual installation and prosecution of the work.

### SECTION 1305.0 EXISTING BUILDINGS

**1305.1 Protection:** All existing and adjoining public and private property shall be protected from damage incidental to construction operations.

**1305.2 Chimney, soil and vent stacks:** Whenever a new building or structure is erected to greater or less heights than an adjoining building, the construction and extension of new or existing chimneys shall conform to the provisions of Section 1005.0 and of soil and vent stacks and the location of window openings shall conform to the provisions of Section 1705.4.

**1305.3 Adjoining walls:** The owner of the new or altered structure shall preserve all adjoining independent and party walls from damage as provided herein. He shall underpin where necessary and support the adjoining building or structure by proper foundations to comply with Section 1307.0.

**1305.3.1 Maintenance:** In case an existing party wall is intended to be used by the person who causes an excavation to be made, and such party wall is in good condition and sufficient for the use of both the existing and proposed building, such person shall preserve the party wall from injury and support it by proper foundations at his own expense, so that it shall be and shall remain as safe and useful as it was before the excavation was commenced. During the demolition, the party wall shall be maintained weather-proof and structurally safe by adequate bracing until such time as the permanent structural supports shall have been provided.

**1305.3.2 Beam holes:** When a structure involving a party wall is being demolished, the owner of the demolished structure shall, at his own expense, bend over all wall anchors at the beam ends of the standing wall and shall brick-up all open beam holes and otherwise maintain the safety and usefulness of the wall.

**1305.3.3 Party wall exitways:** A party wall balcony or horizontal exit shall not be destroyed unless and until a substitute means of egress has been provided and approved by the building official.

**1305.4 Adjoining roofs:** When a new building or demolition of an existing building is being prosecuted at a greater height, the roof, roof outlets and roof structures of adjoining buildings shall be protected against damage with adequate safeguards by the person doing the work.

### SECTION 1306.0 PROTECTION OF PUBLIC AND WORKMEN

**1306.1 General:** Whenever a building or structure is erected, altered, repaired, removed or demolished, the operation shall be conducted in a

safe manner and suitable protection for the general public and workmen employed thereon shall be provided.

**1306.2 Fences:** Every construction operation located five (5) feet or less from the street lot line shall be enclosed with a fence not less than eight (8) feet high to prevent entry of unauthorized persons. When located more than five (5) feet from the street lot line, a fence or other barrier shall be erected when required by the building official. All fences shall be of adequate strength to resist the wind pressure as specified in Section 715.0.

**1306.3 Sidewalk bridge:** Whenever the ground is excavated under the sidewalk, a sidewalk bridge shall be constructed at least four (4) feet wide, or a protected walkway of equal width shall be erected in the street, provided the required permit for such walkway is obtained from the administrative authority.

**1306.4 Sidewalk shed**

**1306.4.1 Within ten feet of street lot line:** When any building or part thereof which is located within ten (10) feet of the street lot line is to be erected or raised to exceed forty (40) feet in height, or whenever a building more than forty (40) feet in height within ten (10) feet of the street lot line is to be demolished, a sidewalk shed shall be erected and maintained for the full length of the building on all street fronts for the entire time that work is performed on the exterior of the building.

**1306.4.2 Within 20 feet of street lot line:** When the building being demolished or erected is located within twenty (20) feet of the street lot line and is more than forty (40) feet in height, exterior flare fans or catch platforms shall be erected at vertical intervals of not more than two (2) stories.

**1306.4.3 Buildings higher than six stories:** When the building being demolished or erected is more than six (6) stories or seventy-five (75) feet in height, unless set back from the street lot line a distance more than one-half ( $\frac{1}{2}$ ) its height, a sidewalk shed shall be provided.

**1306.4.4 Walkway:** An adequately lighted walkway at least four (4) feet wide and eight (8) feet high in the clear shall be maintained under all sidewalk sheds for pedestrians. Where ramps are required, they shall conform to the provisions of this article and Section 615.0.

**1306.5 Thrust-out platforms:** The building official may approve thrust-out platforms or other substitute protections in lieu of sidewalk sheds when deemed adequate to insure the public safety. Thrust-out platforms shall not be used for the storage of materials.

**1306.6 Watchman:** Whenever a building is being demolished, erected or altered, a watchman shall be employed to warn the general public when intermittent hazardous operations are conducted across the sidewalk or walkway.

**SECTION 1307.0 EXCAVATIONS**

**1307.1 Temporary support:** Until permanent support has been provided, all excavations shall be safeguarded and protected by the person causing the excavations to be made, to avoid all danger to life or limb. Where necessary, such excavations shall be retained by temporary retaining walls, sheet-piling and bracing or other approved method to support the adjoining earth.

**1307.1.1 Examination of adjoining property:** Before any excavation or demolition is undertaken, license to enter upon adjoining property for the purpose of physical examination shall be afforded by the owner and tenants of such adjoining property to the person undertaking such excavation or demolition, prior to the commencement and at reasonable periods during the progress of the work.

**1307.1.2 Notice to the building official:** If the person who causes an excavation to be made or an existing structure to be demolished has reason to believe that an adjoining structure is unsafe, he shall forthwith report in writing to the building official. The building official shall inspect such premises, and if the structure is found unsafe, he shall order it repaired as provided in Section 124.0.

**1307.1.3 Responsibility of adjoining owner:** The person making or causing an excavation to be made shall, before starting the work, give at least one (1) week's notice in writing to the owner of each neighboring building or structure, the safety of which may be affected. Having received consent to enter a building, structure or premises, he shall make the necessary provisions to protect it structurally and to insure it against damage by the elements which may ensue from such excavation. If license to enter is not afforded, then the adjoining owner shall have the entire responsibility of providing both temporary and permanent support of his premises at his own expense; and for that purpose, he shall be afforded the license when necessary to enter the property where the excavation is to be made.

**1307.1.4 Excavations for other than construction purposes:** Excavations made for the purpose of removing soil, earth, sand, gravel, rock or other materials shall be performed in such a manner as will prevent injury to neighboring properties or to the street which adjoins the lot where such materials are excavated, and to safeguard the general public health and welfare.

**1307.2 Permanent Support**

**1307.2.1 Deep excavations:** Whenever an excavation is made to a depth of more than [number] feet below the established curb, the person who causes such excavation to be made, if afforded the necessary license to enter the adjoining premises, shall preserve and protect from injury at all times and at his own expense such adjoining structure or premises which may be affected by the excavation. If the necessary license is not afforded,

it shall then be the duty of the owner of the adjoining premises to make his building or structure safe by installing proper underpinning or foundations or otherwise; and such owner, if it be necessary for the prosecution of his work shall be granted the necessary license to enter the premises where the excavation or demolition is contemplated.

**1307.2.2 Shallow excavations:** Wherever an excavation is made to a depth less than [number] feet below the curb, the owner of a neighboring building or structure the safety of which may be affected by the proposed excavation, shall preserve and protect from injury and shall support his building or structure by the necessary underpinning or foundations. If necessary for that purpose, he shall be afforded a license to enter the premises where the excavation is contemplated.

**Note. Depth of excavations:** Provisions have been incorporated in this code for the support of neighboring buildings and structures; and to fix the responsibility for the safety of such buildings and structures by statute. When special legal provision is not made, the common law requires that an excavator is only responsible for reasonable care in the prosecution of his work to avoid damage to adjoining structures. The depth of excavation at which the excavator's responsibility should start is a matter of local policy and rule and varies in different jurisdictions. The jurisdiction should specify the limiting depth at which responsibility changes. In Niagara Falls, New York, it is fixed at three (3) feet, the assumed frost line, which is the minimum required legal depth for all foundations in that jurisdiction. In New York City, the statutory depth is ten (10) feet. When the neighboring land adjoining an excavation is in its natural state and there are not structures erected thereon, the owner of such land should also be entitled to permanent support as provided in this code; and the person proposing to excavate should not be relieved from the responsibility to maintain conditions that guarantee the safety of the public.

## SECTION 1308.0 REGULATION OF LOTS

**1308.1 Grading of lot:** When a building has been demolished and building operations have not been projected or approved, the vacant lot shall be filled, graded and maintained in conformity to the established street grades at curb level. The lot shall be maintained free from the accumulation of rubbish and all other unsafe or hazardous conditions which endanger the life or health of the public; and provisions shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

**1308.2 Utility connections:** All service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authoritative agency having jurisdiction.

### SECTION 1309.0 RETAINING WALLS AND PARTITION FENCES

**1309.1 General:** When the adjoining grade is not higher than the legal level, the person causing an excavation to be made shall erect, when necessary, a retaining wall at his own expense and on his own land. Such wall shall be built to a height sufficient to retain the adjoining earth, shall be properly coped as required in Section 870.0 and shall be provided with a guard-rail or fence not less than forty-two (42) inches in height.

### SECTION 1310.0 STORAGE OF MATERIALS

**1310.1 General:** All materials and equipment required in construction operations shall be stored and placed so as not to endanger the public, the workmen or adjoining property.

**1310.2 Design capacity:** Materials or equipment stored within the building, or on sidewalks, sheds or scaffolds shall be placed so as not to overload any part of the construction beyond its design capacity, nor interfere with the safe prosecution of the work.

**1310.3 Special loading:** Unless the construction is designed for special loading, materials stored on sidewalk sheds and scaffolds shall not exceed one (1) day's supply. All materials shall be piled in an orderly manner and height, to permit removal of individual pieces without endangering the stability of the pile.

**1310.4 Pedestrian walkways:** Materials or equipment shall not be stored on the street without a permit issued by the administrative official having jurisdiction. When so stored they shall not unduly interfere with vehicular traffic, or the orderly travel of pedestrians on the highways and streets. The piles shall be arranged to maintain a safe walkway not less than four (4) feet wide, unobstructed for its full length, and adequately lighted at night and at all necessary times for the use of the public.

**1310.5 Obstructions:** Material and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, utility boxes, catch basins, or manholes, nor shall they be located within twenty (20) feet of a street intersection, or so placed as to obstruct normal observations of traffic signals or to hinder the use of street car loading platforms.

### SECTION 1311.0 REMOVAL OF WASTE MATERIAL

**1311.1 General:** Material shall not be dropped by gravity or thrown outside the exterior walls of a building during demolition or erection. Wood or metal chutes shall be provided for this purpose and any material which in its removal will cause an excessive amount of dust shall be wet down to prevent the creation of a nuisance.



## SECTION 1312.0 PROTECTION OF ADJOINING PROPERTY

**1312.1 General:** Adjoining property shall be completely protected from any damage incidental to the building operation when the owner of the adjoining property permits free access to the building at all reasonable times to provide the necessary safeguards in accordance with Section 1307.0.

## SECTION 1313.0 PROTECTION OF FLOOR AND WALL OPENINGS

**1313.1 Noncombustible floor construction:** The arches, slabs or structural floor fillings of buildings of fireproof construction (Type 1) and noncombustible construction (Type 2) shall be installed as the building progresses.

**1313.2 Combustible floor construction:** In wood joist floor construction (Types 3 and 4) when double flooring is used, the underfloor shall be laid on each story as the building progresses; and when double floors are not used, the floors shall be planked over two (2) stories below the level where work is being performed.

**1313.3 Steel structural frames:** In steel construction, the entire tier of iron or steel beams upon which the structural work is in progress shall be planked over, with the exception of necessary hoistways and permanent openings; and the steel work shall not advance more than six (6) floors ahead of the permanent floor construction.

**1313.4 Guard rails:** All floor and wall openings shall be protected with substantial guard rails and toe boards in accordance with accepted engineering practice.

## SECTION 1314.0 SCAFFOLDS

**1314.1 Load capacity:** Scaffolds and their components shall be capable of supporting without failure at least four (4) times the maximum intended load. All platforms and supporting elements of scaffolds shall be designed and constructed to support uniform minimum live loads in pounds per square foot (psf) of the platform area in accordance with the classifications described in the following Table 1314.

**1314.2 Erection:** Built-up, swinging, and suspended scaffolds shall be erected by competent workmen only.

### 1314.3 Fire-retardant construction

**1314.3.1 All buildings:** All scaffolding exceeding eighty-five (85) feet or seven (7) stories in height used in construction operations involving the erection, alteration or maintenance of buildings, shall be constructed of noncombustible or fire-retardant materials complying with the provisions of Section 903.0.



**Table 1314**  
**SCAFFOLD LOAD CAPACITY**

Classification	Service type	Load (pounds per square foot)
Light duty	Carpenters	25
	Stone setters	25
	(No stone on scaffold)	
	Miscellaneous	25
Medium duty	(No material on scaffold)	
	Bricklayers	50
	Stucco	50
	Lathers & plasterers	50
Heavy duty	Stone masons	75

**1314.3.2 Institutional buildings:** All scaffolding used in construction operations involving the repair or partial demolition of institutional buildings (use groups I-1 and I-2), during occupancy of the building shall be constructed of noncombustible or fire-retardant materials complying with the provisions of Section 903.0.

### SECTION 1315.0 HOISTS

**1315.1 Hoist protection:** All material hoists shall be adequately protected; and when erected on the outside of a building over eighty-five (85) feet or seven (7) stories in height, the structure shall be built of noncombustible or approved fire-retardant materials with the exception of the loading platform.

**1315.2 Passengers prohibited:** Persons shall not be permitted to ride a material hoist; and temporary elevators shall be installed when necessary to transport workmen as provided in Article 16.

**1315.3 Guarding of cables:** All hoisting cables and signal cords shall be guarded wherever they pass through or cross working spaces to prevent injury to persons.

**1315.4 Riggers license:** All persons engaged in the erection of derricks and other hoisting apparatus shall secure a license or certificate of fitness for the performance of such work from the authorized administrative official.

### SECTION 1316.0 STAIRWAYS AND LADDERS

**1316.1 Temporary stairways:** When a building has been constructed to a greater height than fifty (50) feet or four (4) stories, or when an existing building which exceeds fifty (50) feet in height is altered, at least one (1) temporary lighted stairway shall be provided unless one (1) or more of the permanent stairways are erected as the construction progresses.

**1316.2 Ladders:** Temporary ladders, when permitted for access to floors before stairways are installed, or which are designed for other working purposes, shall extend at least forty-two (42) inches above the floor level which they serve.

## SECTION 1317.0 LIGHTING

**1317.1 General:** All stairways and parts of buildings under demolition, erection or repair shall be adequately lighted while persons are engaged at work, to comply with the provisions of Sections 624.0 and 1501.2.5.

## SECTION 1318.0 FIRE HAZARDS

**1318.1 General:** The provisions of this code and of the fire prevention regulations shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

**1318.2 Temporary heating:** Whenever salamanders or other heating devices are used for temporary heating, all regulations as to maximum temperature, distance from combustible materials, spark arrestors, removal of noxious gases, and other requirements prescribed by the building official shall be fully observed. When the source of temporary heat consists of salamanders or other open-flame devices, temporary canvas enclosures shall comply with Section 904.0.

**1318.3 Steam boilers:** All temporary or permanent high pressure steam boilers shall be operated only by licensed operating engineers in accordance with the provisions of the mechanical code listed in Appendix B. When located within a building or within ten (10) feet thereof, all such boilers shall be enclosed with approved noncombustible construction.

**1318.4 Storage of flammables:** Storage of gasoline for hoists, oils, paints and other highly flammable materials shall be permitted only as specified in Article 4 and when stored in approved safety containers. The storage of larger quantities may be approved by the administrative official when stored in separate compartments or enclosures of approved noncombustible construction.

**1318.5 Flame cutting and welding:** The use of oxyacetylene torches for cutting or welding shall be permitted only in accordance with the applicable standards for air and gas welding in building construction.

**1318.6 Concrete forms:** Combustible materials shall not be stored on any floor of a building under construction until all combustible concrete forms are removed from the tier immediately above.

**1318.7 Fire-extinguishing equipment:** Required fire extinguishers, water buckets, auxiliary fire-fighting tools or other portable extinguishing equipment shall be installed and maintained on all floors of a construction

operation in accessible locations as required in Article 12 and the fire prevention regulations.

**1318.8 Standpipes and fire lines:** Where standpipes are provided as a permanent part of the building, they shall be installed and made ready for instant use of the fire department as the structure progresses in accordance with the provisions of Section 1212.0. Free access from the street to such standpipes shall be maintained at all times; and materials shall not be stored within five (5) feet of any fire hydrant or in the roadway between such hydrant and the center line of the street.

**1318.9 Housekeeping:** Rubbish and trash shall not be allowed to accumulate on the site and shall be removed as fast as conditions warrant; combustible rubbish shall be removed daily, and shall not be disposed of by burning on the premises or in the immediate vicinity, and the entire premises and area adjoining and around the operation shall be kept in a safe and sanitary condition and free of accumulations of trash, rubbish, nuts, bolts, small tools and other equipment.

#### SECTION 1319.0 HEALTH HAZARDS

**1319.1 General:** Every construction or maintenance operation which results in the diffusion of dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of local ventilation or other protective devices to insure the safety of the public as required by the regulations of the administrative official.

**1319.2 Removal of dust:** Dust, sand blasts or other harmful agents, when employed or occurring in construction operations, shall be disposed of at or near the point of origin to prevent their diffusion over adjoining premises or streets.

**1319.3 Protective equipment:** Facilities shall be provided for housing the necessary vision, respiratory and protective equipment required in welding operations in approved closed containers and in accordance with the regulations of the administrative official.

#### SECTION 1320.0 WELDING SAFETY PRECAUTIONS

**1320.1 Welding enclosures:** All welding and flame-cutting operations shall be performed in protected areas with full consideration to safety and fire hazards. Such closed spaces shall be properly ventilated while welding or cutting is being done. Suitable protection against the rays of the electric arc shall be maintained by the contractor where arc-welding operations might be viewed within harmful range by persons other than the welding operators and inspectors.

**1320.2 Flammable materials:** Proper precautions shall be taken to

avoid all risk of fire or explosion, and flammable or explosive materials shall not be stored in the vicinity of welding or cutting operations.

### **SECTION 1321.0 SANITATION**

**1321.1 General:** Every building in the course of demolition, erection or repair shall be provided with toilet and drinking water facilities which shall be constructed and installed in accordance with the plumbing code listed in Appendix B.

### **SECTION 1322.0 DISPUTES**

**1322.1 General:** The building official, when requested by any person, aggrieved or otherwise, shall serve a written notice on any owner, tenant and their agents who fail to conform to the requirements of this article directing him to take the necessary remedial action. If the person whose duty it is to protect his own or adjoining property under those provisions fails to proceed to fully comply with such notice within three (3) days of the receipt thereof, or within a reasonable time thereafter as determined by the building official, he may cause the necessary work to be done when the health, safety and general welfare of the public are involved. The cost of such work shall become a lien against the property of the offending owner and the legal authority of the jurisdiction shall institute appropriate action for its recovery.

# ARTICLE 14

## SIGNS

### SECTION 1400.0 GENERAL

**1400.1 Scope:** The provisions of this article shall govern the construction, alteration, repair and maintenance of all signs, together with their appurtenant and auxiliary devices in respect to structural and fire safety.

**1400.2 Zoning law:** Where more restrictive in respect to location, use, size or height of signs, the limitations of the zoning laws affecting required light and ventilation requirements and use of land shall take precedence over the regulations of this code.

**1400.3 Approved rules:** In the absence of approved rules governing details of construction, the provisions of the applicable standards listed in Appendix B shall be deemed to conform to the requirements of this code unless otherwise specified in this article.

### SECTION 1401.0 PLANS, SPECIFICATIONS AND PERMITS

**1401.1 Owner's consent:** Before any permit is granted for the erection of a sign; plans and specifications shall be filed with the building official showing the dimensions, materials and required details of construction, including loads, stresses and anchorage. The applications shall be accompanied by the written consent of the owner or lessee of the premises upon which the sign is to be erected.

**1401.2 New signs:** A new sign shall not hereafter be erected, constructed, altered or maintained except as herein provided and until after a permit has been issued by the building official and the required bond shall have been filed in accordance with Section 1406.0.

**1401.3 Identification:** Every sign for which a permit has been issued and hereafter erected, constructed or maintained shall be plainly marked with the name of the person, firm or corporation owning, erecting, maintaining or operating such sign. The method and location of this identification shall appear on the plans and within the specification filed with the building official.

**1401.4 Alterations:** A sign shall not be enlarged or relocated except in conformity to the provisions of this article for new signs, nor until a proper permit has been secured. The changing of movable parts of an approved sign that is designed for such changes, or the repainting or reposting of display matter, shall not be deemed an alteration; provided the conditions of the original approval and the requirements of this article are not violated.

### SECTION 1402.0 EXEMPTIONS

**1402.1 General:** A permit shall not be required for the signs covered by the provisions of this section. Such exceptions, however, shall not be construed to relieve the owner of the sign from responsibility for its erection and maintenance in a safe manner.

**1402.2 Wall signs:** A sign painted on the surface of a fence or approved building wall; or any non-illuminated wall sign on a building or structure which is not more than ten (10) square feet in area.

**1402.3 Ground signs:** The ground signs listed in the following Sections 1402.3.1 through 1402.3.3 shall not require a permit.

**1402.3.1 Sale or rent:** Signs erected to announce the sale or rent of the property so designated, provided such signs are not more than twenty-five (25) square feet in area.

**1402.3.2 Transit directions:** The erection or maintenance of a sign designating the location of a transit line, a railroad station or other public carrier when not more than three (3) square feet in area.

**1402.3.3 Street signs:** Signs erected by a jurisdiction for street direction.

**1402.4 Projecting signs:** A projecting sign not exceeding two and one-half (2½) square feet of display surface.

### SECTION 1403.0 UNSAFE AND UNLAWFUL SIGNS

**1403.1 Notice of unsafe signs:** When any sign becomes insecure, in danger of falling, or otherwise unsafe, or if any sign shall be unlawfully installed, erected or maintained in violation of any of the provisions of this code, the owner thereof or the person or firm maintaining same, shall upon written notice of the building official, forthwith in the case of immediate danger and in any case within not more than ten (10) days, make such sign conform to the provisions of this article or shall remove it. If within ten (10) days the order is not complied with, the building official may remove such sign at the expense of the owner or lessee thereof as provided in Section 124.0.

**1403.2 Unlawful signs:** The location or positioning of signs listed in the following Sections 1403.2.1 through 1403.2.4 shall be considered unlawful.

**1403.2.1 Egress obstructions:** A sign shall not be erected, constructed, or maintained so as to obstruct any fire escape, required exitway, window or door opening used as an element of a means of egress or to prevent free passage from one part of a roof to another part thereof or access thereto as required by the provisions of Article 6 or for the fire-fighting forces having jurisdiction.

**1403.2.2 Obstruction to ventilation:** A sign shall not be attached in any form, shape or manner which will interfere with any opening required for ventilation by Article 5; except that such signs may be erected in front of and may cover transom windows when not in violation of the provisions of this code.

**1403.2.3 Projecting signs:** A projecting sign erected at other than right angles to the wall of a building or structure outside of the building line which extends above the roof cornice or parapet wall, or above the roof level when there is not a cornice or parapet wall and which obstructs access to the roof is hereby deemed unlawful. Such signs shall be reconstructed or removed as herein required.

**1403.2.4 Alley signs:** Signs shall not be permitted to project beyond alley lot lines.

## SECTION 1404.0 EXISTING SIGNS

**1404.1 Removing or reconstructing signs:** A sign heretofore approved and erected shall not be repaired, altered or moved, nor shall any sign, or any substantial part thereof, which is blown down, destroyed or removed be re-erected, reconstructed, rebuilt or relocated unless it is made to comply with all applicable requirements of this article.

**1404.2 Repair of unsafe signs:** This section shall not be construed to prevent the repair or restoration to a safe condition as directed by the building official of any part of an existing sign when damaged by storm or other accidental emergency.

**1404.3 Relocating signs:** Any sign that is moved to another location either on the same or to other premises shall be considered a new sign and a permit shall be secured for any work performed in connection therewith when required by this article.

## SECTION 1405.0 MAINTENANCE AND INSPECTION

**1405.1 Removal:** The building official may order the removal of any sign that is not maintained in accordance with the provisions of this article.

**1405.2 Maintenance:** All signs for which a permit is required, together with all their supports, braces, guys, and anchors shall be kept in repair in accordance with the provisions of this article and Article 1; and when

not galvanized or constructed of approved corrosion-resistive noncombustible materials shall be painted when necessary to prevent corrosion.

**1405.3 Housekeeping:** It shall be the duty and responsibility of the owner or lessee of every sign to maintain the immediate premises occupied by the sign in a clean, sanitary and healthful condition.

**1405.4 Inspection:** Every sign shall be subject to the inspection and approval of the building official.

## **SECTION 1406.0 BONDS AND LIABILITY INSURANCE**

**1406.1 Filing:** A person shall not erect, install, remove, rehang or maintain over public property any sign for which a permit is required under the provisions of this code until an approved bond shall have been filed in the sum of [amount] as herein required or until an insurance policy shall have been filed for public liability in the amount of [amount] per accident and for property damage in the amount of [amount] as herein required.

**1406.2 Conditions:** Such bond or insurance policy shall protect and save the jurisdiction of [name of jurisdiction] harmless from any and all claims or demands for damages by reason of any negligence of the sign hanger, contractor or his agents, or by any reason of defects in the construction, or damages resulting from the collapse, failure or combustion of the sign or parts thereof.

**1406.3 Notice of cancellation:** The obligation herein specified shall remain in force and effect during the life of every sign and shall not be cancelled by the principal or surety until after thirty (30) days' notice to the building official.

## **SECTION 1407.0 GENERAL REQUIREMENTS FOR ALL SIGNS**

**1407.1 Construction:** All signs shall be designed and constructed in conformity to the provisions for materials, loads and stresses of Articles 7 and 8 and the requirements of this article.

**1407.2 Design loads:** Loads listed in the following Sections 1407.2.1 through 1407.2.2 shall be as the minimum for the design of signs.

**1407.2.1 Wind:** All signs shall be designed and constructed to withstand wind pressure as provided in Section 715.1 for ground signs and Section 715.2 for roof signs.

**1407.2.2 Earthquake:** Signs adequately designed to withstand wind pressures shall generally be considered capable of withstanding earthquake shocks, except as provided in Section 716.0 and for combined loading in Section 717.0.

**1407.3 Illumination:** A sign shall not be illuminated by other than



electrical means and electrical devices and wiring shall be installed in accordance with the requirements of the National Electrical Code listed in Appendix B. Any open spark or flame shall not be used for display purposes unless specifically approved by the building official for locations outside of the fire limits.

**1407.4 Use of combustibles:** The following Sections 1407.4.1 through 1407.4.2 shall apply to combustible material for signs.

**1407.4.1 Ornamental features:** Wood or approved plastic as provided in Article 19 or other materials of combustible characteristics similar to wood may be used for moldings, cappings, nailing blocks, letters and latticing when permitted in Section 1408.2, and for other purely ornamental features of signs in accordance with the approved rules.

**1407.4.2 Sign facings:** Sign facings may be made of approved combustible plastic providing the area of such facing section is not more than one hundred and twenty (120) square feet, and the wiring for electric lighting is entirely enclosed in the sign cabinet with a clearance of not less than two (2) inches from the facing material.

**1407.5 Servicing devices:** Ladders, platforms, hooks, rings and all other devices for the use of servicing personnel shall have safety devices and design loading in accordance with the safety requirements in Appendix B.

**1407.6 Animated devices:** Signs which contain moving sections or ornaments shall have fail-safe provisions to prevent the section or ornament from releasing and falling or shifting its center of gravity more than fifteen (15) inches. The fail-safe device shall be in addition to the mechanism and its housing which operate the movable section or ornament. The fail-safe device shall be capable of supporting the full dead weight of the section or ornament when the moving mechanism releases.

## SECTION 1408.0 GROUND SIGNS

**1408.1 Bottom clearance:** The bottom capping of all ground signs shall be at least thirty (30) inches above the ground but the intervening space may be filled with open lattice work or platform decorative trim.

**1408.1.1 Fire limits:** In the fire limits, a ground sign shall not be constructed of combustible materials, except as provided in Section 1407.4.

**1408.1.2 Outside fire limits:** Outside the fire limits, the structural frame of ground signs shall not be erected of combustible materials to a height of more than thirty-five (35) feet above the ground.

**1408.2 Maximum size:** In all locations, when constructed entirely of noncombustible material, ground signs may be erected to a height of one hundred (100) feet above the ground; and to greater heights when approved by the building official and located so as not to create hazard or danger to the public.

### SECTION 1409.0 ROOF SIGNS

**1409.1 Materials:** All roof signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in Section 1407.4. Provisions shall be made for electric ground of all metallic parts; and where combustible materials are permitted in letters or other ornamental features, all wiring and tubing shall be kept free and insulated therefrom.

**1409.2 Bottom clearance:** There shall be a clear space of not less than six (6) feet between the lowest part of the sign and the roof level, except for necessary structural supports.

**1409.3 Closed signs:** A closed roof sign shall not be erected to a height greater than fifty (50) feet above the roof of Types 1 and 2 constructed buildings nor more than thirty-five (35) feet above the roof of Type 3 and 4 constructed buildings.

**1409.4 Open signs:** An open roof sign shall not exceed a height of one hundred (100) feet above the roof of buildings of Types 1 and 2 construction; and not more than sixty (60) feet above the roof of buildings of Type 3 and 4 construction.

**1409.5 Combustible supports:** Within the fire limits, a roof sign which exceeds forty (40) feet in height shall not be supported on or braced to wooden beams or other combustible construction of a building or structure unless otherwise approved by the building official.

### SECTION 1410.0 WALL SIGNS

**1410.1 Materials:** Wall signs which have an area exceeding forty (40) square feet shall be constructed of metal or other approved noncombustible materials, except for nailing rails and as provided in Section 1407.4.

**1410.2 Extension:** Wall signs shall not be erected to extend above the top of the wall, nor extend beyond the ends of the wall to which they are attached, unless meeting all the requirements for roof signs, projecting signs or ground signs as the case may be.

### SECTION 1411.0 PROJECTING SIGNS

**1411.1 Materials:** Projecting signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in Section 1407.4.

**1411.2 Maximum projection:** A projecting sign shall not extend beyond a vertical plane two (2) feet inside the curb line.

**1411.3 Clearances:** A clear space of not less than ten (10) feet shall be provided below all parts of such signs.

**1411.4 Additional loads:** Projecting sign structures which could be used to support an individual on a ladder or other servicing device whether or not specifically designed for the servicing device shall be capable of supporting the anticipated additional load but in no case less than one hundred (100) pounds concentrated horizontal load and three hundred (300) pounds vertical concentrated load applied at the point of assumed loading or point of most excentric loading. The building component to which the projecting sign is attached shall also be designed to support the additional loads.

### **SECTION 1412.0 MARQUEE SIGNS**

**1412.1 Materials:** Marquee signs shall be constructed entirely of metal or other approved noncombustible materials except as provided in Section 1407.4.

**1412.2 Marquee:** Marquee signs shall be attached to approved marquees constructed in accordance with Section 310.10.

**1412.3 Dimensions:** Marquee signs may extend the full length, but they shall not project beyond the perimeter of the marquee.

### **SECTION 1413.0 MISCELLANEOUS AND TEMPORARY SIGNS**

**1413.1 Banner and cloth signs:** Temporary signs and banners attached to or suspended from a building, constructed of cloth or other combustible material shall be strongly constructed and shall be securely attached to their supports. They shall be removed as soon as torn or damaged, and not later than sixty (60) days after erection; except that permits for temporary signs suspended from or attached to a canopy or marquee shall be limited to a period of ten (10) days.

**1413.2 Maximum size:** Temporary signs of combustible construction shall be not more than ten (10) feet in one (1) dimension nor more than five hundred (500) square feet in area.

**1413.3 Supports:** When more than one hundred (100) square feet in area, temporary sign and banners shall be constructed and fastened to supports capable of withstanding the design loads listed in Section 715.0.

**1413.4 Special permits:** Temporary signs used for holiday, public demonstrations or promotion of civic welfare or charitable purposes which extend across streets or other public spaces, shall be subject to special approval of the authority having jurisdiction.

### **SECTION 1414.0 ILLUMINATED SIGNS**

**1414.1 Certificates:** All electrically illuminated signs shall be certified as to electric wiring and devices by the authoritative agency having juris-

diction, and all wiring and accessory electrical equipment shall conform to the requirements of the National Electrical Code listed in Appendix B.

**1414.2 Additional permits:** Electrical permits shall be issued for the erection or maintenance of illuminated signs.

**1414.3 Relettering signs:** The requirements of this section shall not apply to the relettering of illuminated signs, except where such relettering requires a change of wiring or piping of the sign.

### **SECTION 1415.0 PORTABLE SIGNS**

**1415.1 Conformance:** Portable signs shall conform to all requirements for ground, roof, projecting flat and temporary signs when they are used in a similar capacity. The stipulations in this section shall not be construed as to require portable signs to have connections to surfaces, tie-downs or foundations when provisions are made by temporary means or configuration of the structure to provide stability for the expected duration of the installation.

**1415.2 Electrical:** Portable signs which require electrical service shall have a positive connecting device on the sign. Electrical service lines to the sign shall be protected from damage from all anticipated traffic.

# ARTICLE 15

## ELECTRIC WIRING AND EQUIPMENT

### SECTION 1500.0 GENERAL

**1500.1 Scope:** The provisions of this article shall control the design and construction of all new installations of electrical conductors and equipment in buildings and structures; and all alterations to existing wiring systems therein to insure safety. All such installations shall conform to the provisions of this article and accepted engineering practice as defined in the National Electrical Code listed in Appendix B.

**1500.2 Exceptions:** Electrical wiring shall not be installed in a building or structure, nor shall an alteration of an existing electric wiring system be made until a permit has been issued therefor as required in Section 1501.0, except as provided in the following Sections 1500.2.1 through 1500.2.3.

**1500.2.1 Public service agencies:** The provisions of this code shall not apply to installations for electric supply or communication agencies in the generation, transmission or distribution of electricity, or the operation of signals, or the transmission of intelligence, or to installations located within or on buildings or premises used exclusively by such agency, or on public thoroughfares.

**1500.2.2 Railway utilities:** The provisions of this code shall not apply to the installations or equipment employed by a railway utility in the exercise of its functions as a public carrier, and located outdoors or in buildings used exclusively for that purpose.

**1500.2.3 Radio and television transmitting stations:** The provisions of this code shall not apply to electrical equipment used for radio and television transmission, except the equipment and wiring for power supply and the installations of towers and antennae, whether erected on buildings or on the ground.

**1500.3 Electric installation standards:** Conformity of installations of electric conductors and equipment to the applicable standards of the National Electrical Code and other accepted engineering standards listed in Appendix B shall be the prima facie evidence that such installations

are reasonably safe for use in the service intended and in compliance with the provisions of this code.

**1500.4 Electric equipment standards:** The materials, appliances, and other equipment listed in publications of inspected electrical equipment of the Underwriters Laboratories, Inc. (UL), and other accredited authoritative agencies and testing organizations, and installed in accordance with any instructions included as part of such listing, shall be accepted as meeting the requirements of this code.

## SECTION 1501.0 PLANS AND SPECIFICATIONS

**1501.1 General:** Plans, specifications and schedules in sufficient detail shall be filed with the building official, showing the location and capacity of all lighting facilities, electrically operated equipment and electrical circuits required for all service equipment of the building or structure; except as may be modified by the administrative official.

**1501.2 Items covered:** All electrically-controlled devices, signal, communicating and lighting systems, and their wiring, whenever required under the provisions of this code, shall be shown on the plans and elevations of the building or structure with respect to those uses covered by the following Sections 1501.2.1 through 1501.2.9.

**1501.2.1 Emergency and hazard use lighting:** Places of public assembly and control of emergency lighting systems, Sections 417.0 and 624.0, and hazardous uses in Article 4.

**1501.2.2 Exitway and elevator lighting:** Stairway and exitway illumination equivalent to three (3) foot candles, Sections 513.0 and 614.0; *Exit* sign lighting circuits, Section 623.0; elevator car illumination, Section 1605.0.

**1501.2.3 Service equipment:** Electrical equipment and control of heating, refrigerating and ventilating machinery and devices, mechanical code listed in Appendix B.

**1501.2.4 Fire alarm and signal systems:** Fire alarm signal systems, fire department communication and supervisory service, Sections 1216.0, 1217.0 and 1218.0.

**1501.2.5 Construction operations:** Temporary construction lighting requirements equivalent to three (3) foot candles, Section 1317.0.

**1501.2.6 Signs and towers:** Wiring of display signs, Sections 1407.0 and 1414.0; and radio and television antennae, Sections 426.0 and 427.0.

**1501.2.7 Elevators and moving stairways:** Power control and electric operation and circuit wiring of elevators and moving stairways, Article 16.

**1501.2.8 Toilet and bathrooms:** Illumination of toilets and bathrooms equivalent to three (3) foot candles, Section 512.0.

**1501.2.9 Prefabricated circuits:** Loop wiring for prefabricated construction, Sections 1801.0 and 1818.0.

**1501.3 Other authorities:** Where required by local law or ordinance, the plans and specifications for electric wiring shall be approved by all authorities having jurisdiction.

## **SECTION 1502.0 INSPECTION AND TESTS**

**1502.1 During installation:** During the installation of electric systems and equipment, the building official shall make inspections to insure compliance with the provisions of this article, except as provided in Section 1504.0.

**1502.2 Concealing work:** Work in connection with an electric system shall not be covered or concealed until it has been inspected and permission to do so has been granted by the building official.

**1502.3 Final inspection and test:** On completion of the work, the administrative official shall inspect the work and cause tests to be made of the operation of the entire system to insure compliance with all requirements.

**1502.4 Reinspection:** An electrical installation from which electrical service has been discontinued for a period of thirty (30) days or more, shall not have service restored until the system has been reinspected and a new certificate of inspection issued.

## **SECTION 1503.0 TEMPORARY USE**

**1503.1 Permission:** The building official may in his discretion give temporary permission for a reasonable time to supply and use current in part of an electric installation before such installation has been fully completed and the final certificate of approval has been issued; provided that the part covered by the temporary certificate complies with all the requirements specified for temporary lighting, heat or power in the National Electrical Code.

## **SECTION 1504.0 PERMIT AND CERTIFICATE OF INSPECTION**

**1504.1 General:** Electrical wiring or equipment shall not be installed within or on any building or structure or premises, nor shall any alteration be made in any such existing installations, without first securing approval and a permit from the building official except as provided in Section 1504.2. It shall be unlawful to use or permit the use of, or to supply current for an electrical system in a building or structure, unless the required certificate of inspection and permit has been issued by the building official.

**1504.2 Exemptions:** A permit shall not be required for the execution

and use of the classes of work specified in the following Sections 1504.2.1 through 1504.2.4.

**1504.2.1 Repairs and maintenance:** Minor repair work, including the replacement of lamps or the connection of approved portable electrical equipment to approved permanently installed receptacles.

**1504.2.2 Public service agencies:** The installation, alteration or repair of electrical equipment for the operation of communications and signals or the transmission of intelligence by wire by public service agencies except as provided in Article 12 for fire alarm systems.

**1504.2.3 Power companies:** The installation, alteration or repair of electrical equipment of a power or public service company for its use in the generation, transmission, distribution or metering of electricity.

**1504.2.4 Temporary testing systems:** The installation of any temporary system required for the testing or servicing of electrical equipment or apparatus.

**1504.3 Annual permit:** In lieu of an individual permit for each alteration to an already approved electrical installation, the building official may issue an annual permit upon application therefor to any person, firm or corporation regularly employing one (1) or more certified electricians in the building, structure or premises owned or operated by the applicant for the permit.

**1504.4 Annual records:** The person to whom an annual permit is issued shall keep a detailed record of all alterations to an approved electrical installation made under such annual permit and such records shall be accessible to the building official at all times or shall be filed with him as he may designate.

## SECTION 1505.0 EXISTING INSTALLATIONS

**1505.1 General:** Alterations shall not be made to any existing installations of electric wiring or equipment for which a permit is required within or on any building, structure or premises except as provided in Section 1504.0, without first securing the approval and a permit from the building official.

**1505.2 Defective wiring:** If, upon reinspection, an electric wiring system is found defective and unsafe, the building official shall revoke all certificates and permits in effect; and the use of such system shall be discontinued until it has been made to conform to this article and the approved rules and after a new permit has been issued.

**1505.3 Additional loads:** When additional electrical loads are to be connected to existing service in buildings or structures in other than use group R occupancies, the building official may permit actual maximum demand figures to be used to establish the existing load. New loads shall



be computed in conformance with the requirements of the National Electrical Code listed in Appendix B.

### **SECTION 1506.0 ENERGY CONSERVATION IN ELECTRICAL DISTRIBUTION SYSTEMS**

**1506.1 Power factor:** The power factor of the overall electric distribution system in a building shall be not less than ninety (90) per cent under rated design installed load of the building, either by utilization equipment design or by the use of power factor corrective devices. The power factor corrective devices may be installed on individual equipment, rated greater than one thousand (1,000) watts, and switched therewith, regionally grouped, located at the service equipment or power factor correction achieved by other equivalent means. The choice among these corrective methods should be made based upon an engineering evaluation of each distribution system.

**1506.2 Service voltage:** Where a choice of service voltages is available, the voltage resulting in the least energy loss shall be used.

**1506.3 Voltage drop:** In any building, the maximum total voltage drop shall not exceed three (3) per cent in branch circuits or feeders, for a total of five (5) per cent to the farthest outlet based on steady state design load conditions.

**1506.4 Lighting switching:** Switching shall be provided for each lighting circuit, or for portions of each circuit, so that the partial lighting required for custodial or for effective complementary use with natural lighting may be operated selectively.

**1506.5 Separate metering:** In all multi-family dwellings (use group R-2) provisions shall be made to determine the electrical energy consumed by each tenant.



# ARTICLE 16

## ELEVATOR, DUMBWAITER AND CONVEYOR EQUIPMENT, INSTALLATION AND MAINTENANCE

### SECTION 1600.0 GENERAL

**1600.1 Scope:** Except as may be otherwise provided by statute, the provisions of this article shall control the design, construction, installation, maintenance and operation of all elevators, dumbwaiters, moving stairways, moving walks and special hoisting and conveying equipment hereafter operated, installed, relocated or altered in all buildings and structures. The design, construction, installation, maintenance and operation of all miscellaneous hoisting and elevating equipment and amusement devices shall be subject to such special requirements as are deemed necessary by the building official to secure their safe operation. The provisions of this article shall not apply to portable elevating devices used to handle materials only, and located and operated entirely within one (1) story. All such equipment shall be constructed, operated and maintained in compliance with accepted engineering practice. The construction, alteration, maintenance, operation, inspection and tests of manlifts shall be in conformity to the Safety Standard for Manlifts listed in Appendix B.

**1600.2 Standard code adopted:** Except as otherwise provided in this code, and except where more restrictive provisions govern, the construction, alteration, maintenance, operation, inspections and tests of elevators, dumbwaiters, moving walks and moving stairways shall be in conformity to the Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks listed in Appendix B.

**1600.3 Purpose and exceptions:** The purpose of this code is to provide reasonable safety for life and limb. In case of practical difficulty or unnecessary hardship, the building official may grant exceptions from the literal requirements or permit the use of other methods, but only when it is clearly evident that reasonable safety is thereby secured.

### SECTION 1601.0 PLANS, SPECIFICATIONS AND PERMITS

**1601.1 Application:** The person, firm or corporation responsible for the installation, relocation, or alteration of any equipment covered by this

article shall file an application for permit with the building official accompanied by governing specifications and accurately scaled and fully dimensioned plans showing the location of the installation in relation to the plans and elevation of the building; the location of the machinery room and equipment to be installed, relocated or altered; and all structural supporting members thereof, including foundations; and shall specify all materials to be employed and all loads to be supported or conveyed. Such plans and specifications shall be sufficiently complete to illustrate all details of construction and design.

**1601.2 Permits:** Equipment or devices subject to the provisions of this code shall not be constructed, installed, relocated or altered unless a permit has been received from the building official before the work is commenced. A copy of such permit shall be kept at the construction site at all times while the work is in progress.

**1601.3 Identification of equipment:** In buildings containing more than one (1) elevator or device and where such devices are subject to periodic inspections, each such elevator or device shall be identified by a serial number attached to or painted, stenciled or otherwise registered on the crosshead of the elevator car and on the motor or machine; and on devices other than elevators, on the motor or machine, in figures not less than one (1) inch high. After such devices have been so designated, their numbers shall not be changed except by permission of the building official and all correspondence in regard to such device shall refer to said number.

## SECTION 1602.0 TESTS AND INSPECTIONS

**1602.1 General:** All equipment and devices covered by the provisions of this code shall be subjected to acceptance and maintenance tests and periodic inspections as required herein and in the accepted standard.

**1602.2 Acceptance tests:** Acceptance tests and inspections shall be required on all new, relocated and altered equipment subject to the provisions of this article. The tests and inspection shall be of such nature as to determine whether the entire installation is designed, constructed and installed in compliance with this code and the accepted standards, and shall include all parts of the equipment and machinery. All such tests shall be made in conformity to the requirements of Section 1602.5, in the presence of the building official, by the person, firm or corporation installing such equipment.

**1602.3 Maintenance tests and periodic inspections:** Maintenance tests shall be required on all new and existing power elevators and periodic inspections shall be made of all new and existing equipment subject to the provisions of this article.

**1602.3.1 Maintenance tests:** Maintenance tests shall be made by a qualified agent or agency approved by and in the presence of the building

official, and shall be made at the expense and responsibility of the owner.

**1602.3.2 Periodic inspections:** Periodic inspections shall be made by the building official or by a qualified agent or agency approved by him. Where such inspections are not made by the building official, the approved agent or agency shall submit a detailed report of the inspection to the building official on forms approved by him not more than thirty (30) days following the completion of such inspection.

#### **1602.4 Frequency of tests and inspections**

**1602.4.1 Periodic inspection intervals:** Periodic inspections shall hereafter be made at intervals of not more than six (6) months for all elevators, manlifts and moving stairways; at intervals of not more than twelve (12) months for power dumbwaiters and all dumbwaiters with a capacity of one hundred (100) pounds and over. Miscellaneous hoisting and elevating equipment, conveyors and amusement devices shall be inspected at such intervals as may be deemed necessary by the building official to insure reasonable safety of operation.

**1602.4.2 Maintenance test intervals:** Maintenance tests shall be made at intervals not exceeding the following:

1. power elevator car and counterweight safeties, governors and oil buffers, every five (5) years; and
2. hydraulic elevator and dumbwaiter pressure tanks and piston rods of roped hydraulic elevators and dumbwaiters, every three (3) years.

**1602.5 Minimum requirements for tests and inspections:** The minimum requirements for the inspection and test of the devices subject to this article shall conform to this section.

**1602.5.1 Elevators, dumbwaiters and moving stairways:** The equipment and machinery of elevator, dumbwaiter and moving stairways shall be inspected and tested to the requirements of the standard listed in Appendix B.

**1602.5.2 Material lifts, conveyors and amusement devices:** Material lifts, conveyors and amusement devices shall be inspected and subjected to tests to insure the load capacity and safety of operation. The tests shall cover all operating protectives and safety devices, structural adequacy of the supports and anchorage to floors, walls, ceilings and foundations.

**1602.5.3 Manlifts:** All equipment and machinery of manlifts shall be inspected and tested to insure reasonable safety of operation and shall include tests of the brake, terminal stopping device, belt tension and emergency stopping device. Acceptance tests shall also include a load capacity test as provided in the accepted standard listed in Appendix B.

**1602.5.4 Miscellaneous hoisting and elevating equipment:** All miscellaneous hoisting and elevating equipment shall be subjected to such tests and inspections as may be required by the building official to insure safe operation.

## SECTION 1603.0 CERTIFICATE OF COMPLIANCE

**1603.1 General:** The operation of all equipment governed by the provisions of this article and hereafter installed, relocated or altered shall be unlawful by persons other than the installer thereof until such equipment has been inspected and tested as herein required and a final or limited certificate of compliance has been issued therefor by the building official.

**1603.2 Final certificate of compliance:** The building official shall issue a final certificate of compliance for each unit of equipment which has satisfactorily met all the inspections and tests required by this article. Such final certificate shall bear the signature of the person who made the inspection and tests and shall designate the rated load and speed, the date of the acceptance tests and inspections, and the name of the building official who made or witnessed such test and inspection. The final certificate shall also include the necessary space for inserting the information indicated below.

1. The name of the person who made the periodic inspection and witnessed the periodic and maintenance tests.
2. The date of the periodic inspection and test and of the maintenance test.

**1603.3 Limited certificate of compliance:** The building official may within his discretion issue a limited certificate of compliance for any equipment covered by this article, which is hereafter being installed, relocated or altered, to permit its limited use by the person designated therein during the period of such installation, relocation or alteration. Such certificate shall be signed by the building official and shall bear the dates of issue, renewal and expiration, and shall designate the class of service allowed.

**1603.3.1 Tests and minimum safeguards required:** A limited certificate shall not be issued for an elevator until such elevator has satisfactorily passed the following tests: rated load, car and counterweight safety, and terminal stopping devices. Permanent or temporary guards and enclosures shall be installed on the car, around the hoistway and at the landing entrances. Equipment other than elevators shall be tested and protectives provided as deemed necessary by the building official to insure reasonable safe operation for the limited service specified.

**1603.3.2 Special conditions:** Automatic and continuous-pressure operation elevators shall not be placed in temporary operation from the landing push buttons unless the door locking device and interlocks required by the safety code are installed and operative. When the car can be operated only from the inside, landing entrance guards shall be provided with locks that can be released from the hoistway side only.

**1603.3.3 Time limitation:** Limited certificates of operation shall be issued for periods of not more than thirty (30) days; but may be renewed

within the discretion of the building official for additional periods of not more than thirty (30) days each.

**1603.4 Posting certificates of compliance:** The owner or lessee shall post the last issued certificate of compliance in a conspicuous place inside all elevator cars and on, or immediately adjacent to, the entrance to all other approved equipment.

## SECTION 1604.0 MAINTENANCE AND ACCIDENTS

**1604.1 Owner responsibility:** The owner or his legal agent of the building in which the equipment is located shall be responsible for the care, maintenance and safe operation of all equipment covered by this article after the installation thereof and its acceptance by him. He shall make or cause to be made all maintenance tests and service inspections and shall maintain all equipment in a safe operating condition.

**1604.2 Contractor responsibility:** The person, firm or corporation installing any device covered by this article shall make all acceptance tests and be responsible for the care and safe operation of such equipment during its construction and until temporarily or finally accepted by the building owner or his legal agent.

**1604.3 Maintenance items:** All operating and electrical parts and accessory equipment of devices subject to this article shall be maintained in safe operating condition. The maintenance of elevators, dumbwaiters and escalators shall conform to the standard listed in Appendix B.

**1604.4 Unsafe conditions:** If upon inspection, any equipment covered in this article is found in an unsafe condition, or not in accordance with the provisions of this code, the building official shall thereupon serve a written notice of such finding upon the building owner or lessee, stating the time when recommended repairs or changes must be completed. After the service of such notice, it shall be the duty of the owner to proceed within the time allowed to make such repairs or changes as are necessary to place the equipment in a safe condition; and it shall be unlawful to operate such equipment after the date stated in the notice unless such recommended repairs or changes have been made and the equipment has been approved by the building official, or an extension of time secured from him in writing.

**1604.4.1 Power to seal equipment:** The building official, in addition to any other penalties herein provided, shall have the power to seal out of service any device or equipment covered by this article for the following reasons: when in case of emergency in the opinion of the building official, any such device is in a condition to render it totally unsafe for operation; or for willful failure to comply with recommendations and orders issued by the building official.

**1604.4.2 Notice of sealing out of service:** Before sealing any device out of service, the building official, except in case of emergency, shall serve written notice upon the building owner or lessee stating intention to seal the equipment out of service and the reasons therefor.

**1604.4.3 Unlawful to remove seal:** Any device sealed out of service by the building official shall be plainly marked with a sign or tag indicating the reason for such sealing, and any defacing or removal of the sign or tag, or any tampering with or removal of the seal without approval of the building official, shall constitute a violation of this article.

**1604.5 Accidents reported and recorded:** The owner of the building shall immediately notify the building official of every accident involving personal injury or damage to apparatus on or about or in connection with any equipment covered by this article, and shall afford the building official every facility for investigating such accident. When an accident involves the failure, breakage, damage or destruction of any part of the apparatus or mechanism, it shall be unlawful to use such device until after an examination by the building official and approval of the equipment for continued use. It shall be the duty of the building official to make a prompt examination into the cause of the accident and to enter a full and complete report thereof in the records of the building department. Such records shall be open for public inspection at all reasonable hours.

**1604.6 Removal of damaged parts:** It shall be unlawful to remove any part of the damaged construction or operating mechanism of elevators, or other equipment subject to the provisions of this article, from the premises until permission to do so has been granted by the building official.

## SECTION 1605.0 EXISTING INSTALLATIONS

**1605.1 Retroactive provisions:** The provisions of this article are not retroactive except as specifically provided hereunder; and except further that if, upon inspection of any device covered by this code, the equipment is found in a dangerous condition, or there is an immediate hazard to those riding on or using such equipment, or if the design or the method of operation in combination with devices used is considered inherently dangerous in the opinion of the building official, he shall notify the owner or lessee in writing of the existing condition and shall recommend such alterations or additions as he may deem necessary to eliminate the dangerous condition.

### 1605.2 General requirements

**1605.2.1 Projections into hoistway:** All ledges, floor beams, saddles, timbers and other projections, except door interlocks and contacts, door closers, door tracks and hangers, and door operating or signal devices in front of car openings, landing sills and separator beams between adjacent elevators, that project more than two (2) inches from the inside of the



general surface of the hoistway enclosure shall be fitted with smooth beveled guards set directly over the entire length of the projection. The angle of the bevels or guard plates shall preferably be not less than seventy-five (75) degrees but never less than sixty (60) degrees from the horizontal.

**1605.2.2 Emergency interlock release switch:** Glass or other breakable type covers of car emergency release switches, where provided, shall be maintained in place, and, if not so maintained, the building official shall require that the existing emergency release switch be replaced with one (1) of the key-operated continuous-pressure type.

**1605.2.3 Lighting:** The cars and entrances of all elevators shall be properly lighted at all times when in service. The minimum illumination shall be not less than one (1) foot candle at the landing edge of the platform.

**1605.2.4 Belt and chain-driven machines:** Single-belted and chain-driven machines are permitted only on freight elevators, and only when equipped with electrically released spring applied brakes and with terminal stopping devices and electrical safety devices required for new electric elevators. The brakes shall be applied directly to the hoisting machine and shall be arranged to operate automatically if the driving belt or chain breaks or comes off. Double-belted elevator machines are permitted only on freight elevators and when driven by a line shafting which is used to apply power for other purposes.

**1605.2.5 Replacement or relocation of gate switches or interlocks:** The building official may require the replacement or relocation of car gate electric contacts, safety cutout switches or interlocks where such devices are found to be tied or blocked so as to render them inoperative.

**1605.2.6 Removal of pipes from hoistway:** The building official may order the removal from existing elevator hoistways of any pipe conveying gases, vapors or liquids which might endanger life if discharged into the hoistway or ignited.

### **1605.3 Existing passenger elevators**

**1605.3.1 Hoistway enclosure:** All existing passenger elevator hoistways shall be fully enclosed from floor to ceiling on all floors to comply with Section 1609.0.

**1605.3.2 Hoistway doors and interlocks:** All existing electric and electrically controlled and operated hydraulic passenger elevators shall be provided with hoistway landing doors equipped with approved type interlocks conforming to the requirements for new elevators; except that approved type interlock switches may be installed in connection with existing hoistway door closers, provided the combination door closers and interlocks conform to all the requirements for approved interlocks, except as to the required tests. The use of service and emergency keys for opening

hoistway doors from the landing side shall conform to the requirements of the safety code listed in Appendix B.

**1605.3.3 Car doors and gates:** All openings on existing passenger elevator cars shall be provided with doors or gates. Car doors and gates of electric or electrically controlled and operated hydraulic passenger elevators shall be provided with approved car door or gate electric contacts conforming to the standard listed in Appendix B.

**1605.3.4 Hydraulic passenger elevators:** Hydraulic passenger elevators, except those equipped with electric control and operating devices, shall be provided with self-closing hoistway doors arranged to lock automatically when closed, in lieu of interlocks. Car doors or gates on electric or electrically controlled and operated hydraulic elevators shall be equipped with car door or gate electric contacts conforming to the requirements for new elevators.

**1605.3.5 Emergency signal or telephone:** Existing power-passenger and freight elevators shall be provided with emergency signal devices conforming to the requirements of the standard listed in Appendix B.

#### **1605.4 Existing freight elevators**

**1605.4.1 Hoistway enclosure:** If not now enclosed, an enclosure shall be required on existing freight elevators as required for existing passenger elevators in Section 1605.3, except as provided in Section 1605.4.3.

**1605.4.2 Hoistway doors:** All landing openings in existing electric or electrically controlled and operated hydraulic freight elevator hoistways which are enclosed in fireresistance rated partitions shall be provided with fire doors equipped either with approved hoistway door interlocks, or approved hoistway door electric contacts and mechanical locks, conforming to the safety code listed in Appendix B, or with fusible links and automatic self-closing devices.

**1605.4.3 Landing gates:** Where automatic self-closing landing doors with fusible links are used, or where fireresistance rated hoistway enclosures are not required, the landing openings of electric or electrically controlled and operated hydraulic elevators shall be equipped with landing gates not less than five and one-half (5½) feet high provided with either hoistway gate interlocks, or with hoistway gate electric contacts and mechanical locks conforming to the safety code listed in Appendix B.

**1605.4.4 Hydraulic freight elevators:** Interlocks or electric contacts shall not be used on hydraulic elevator landing doors or gates, except where such elevators are provided with electric control and operating devices; and provided further that the landing openings of such elevators shall be equipped with self-closing gates at least five and one-half (5½) feet high with approved mechanical locks. Full automatic gates shall be prohibited. Semi-automatic gates shall be prohibited, except on hydraulic elevators with mechanical control and operating devices.

**1605.4.5 Gates on cars:** All openings on existing electric or electrohydraulic freight elevator cars, except the opening immediately adjacent to the operating device, shall be provided with car gates and car gate electric contacts when the distance between the hoistway side of the landing door adjacent to such opening and the hoistway edge of the landing threshold is more than four (4) inches. All such elevators using lever, wheel or cable operating devices, shall have car gates and car gate contacts installed at all car openings. All openings on existing continuous-pressure or automatic operation freight elevator cars that can be operated from the landings shall be provided with car gates and car gate electric contacts. Existing sidewalk elevators shall not be subject to the provisions of this section. Car gate electric contacts shall be of approved type conforming to the standard listed in Appendix B.

### SECTION 1606.0 ALTERATIONS

**1606.1 General:** Alterations to existing elevators shall conform to the standards listed in Appendix B. Alterations to all other devices subject to this article shall conform to such requirements as the building official considers necessary for safe operation.

**1606.2 Relocated equipment:** The relocation of an existing installation of any device covered by this article shall be deemed to be a new installation and shall conform to the requirements therefor.

### SECTION 1607.0 POWER ELEVATOR OPERATION

**1607.1 Designated operator:** Every power elevator except automatic and continuous-pressure operation types and sidewalk elevators shall be in charge of a competent designated operator.

**1607.2 Fire department use:** In all structures where elevators are to be installed, there shall be at least one (1) elevator provided for fire department emergency access to all floors. Elevator operation shall be in accordance with ANSI A17.1, listed in Appendix B, and said elevator cab shall have a minimum inside car platform of four (4) feet three (3) inches wide by six (6) feet eight (8) inches deep with a minimum clear opening width of forty-two (42) inches, unless otherwise designed and approved to provide equivalent utility and shall be of such size to accommodate an ambulance cot having a minimum size of twenty-two (22) inches by seventy-eight (78) inches in its horizontal position. In every structure over one hundred and fifty (150) feet in height, a competent elevator operator shall be available at all times to assist the fire department in obtaining access to any floor in the building or structure served by elevators, except where an automatic or continuous-pressure operation elevator is available.

**1607.3 Passenger restriction**

**1607.3.1 Freight operators:** Except as provided in Section 1607.3.2, it shall be unlawful for any person other than the operator or those individuals necessary to handle freight to ride on any elevator other than a passenger elevator; and it shall be unlawful for the owner or other responsible person to permit any individual other than above specified to ride on any elevator other than a passenger elevator.

**1607.3.2 Other employees:** Employees of the owner may ride on a freight elevator, subject to approval of the building official and the requirements of the safety code.

### SECTION 1608.0 ELEVATOR SPEED LIMITS

**1608.1 Maximum:** The car speed limits herein specified shall be the maximum permitted for the types listed.

**1608.2 Non-counterweighted drum elevators:** The speed of all non-counterweighted drum elevators shall be not more than fifty (50) feet per minute.

**1608.3 Sidewalk elevators:** The speed of sidewalk elevators shall not exceed fifty (50) feet per minute where a drum type machine is used, or where the car raises and lowers doors or covers in the sidewalk or other exterior area.

**1608.4 Continuous-pressure elevators:** The speed of continuous-pressure operation elevators shall be not more than one hundred and fifty (150) feet per minute.

### SECTION 1609.0 HOISTWAY ENCLOSURES AND VENTING

#### 1609.1 Fireresistance rating of hoistway enclosures

**1609.1.1 Elevator enclosures:** All elevator and other hoistway enclosures other than dumbwaiter shafts shall be constructed to afford at least the fireresistance rating specified in Table 214 with approved opening protectives conforming to Section 1613.0 and Article 9.

**1609.1.2 Dumbwaiter enclosures:** Shaft enclosures and dumbwaiters having a car area of more than three (3) square feet which travel through more than one (1) story and serve more than two (2) adjacent floors shall be of one (1) hour fireresistance rated construction with approved three-quarter ( $\frac{3}{4}$ ) hour opening protectives or the approved labeled equivalent complying with Article 9, except that when the load capacity exceeds one hundred (100) pounds per square foot (psf) the enclosure and opening protectives shall comply with the requirements of Section 1609.1.1 for fire-resistance rating.

**1609.1.3 Special dumbwaiter enclosures:** The enclosure of dumbwaiters not more than three (3) square feet in area with a load capacity of not

more than twenty-five (25) pounds and all dumbwaiters serving not more than two (2) adjacent levels shall be enclosed with approved noncombustible materials.

**1609.2 Limiting number of elevators in one hoistway enclosure:** The number of elevators permitted in one (1) hoistway shall conform to the standards listed in Appendix B.

**1609.3 Vents required:** Hoistways of elevators and dumbwaiters serving more than three (3) stories shall be provided with means for venting smoke and hot gases to the outer air in case of fire, except as listed below.

1. In buildings other than hotels, apartment houses, hospitals, and similar buildings with overnight sleeping quarters, hoistways not extending into the top story may be provided with approved fire suppression system connected to the building water supply system or to an approved automatic fire suppression system conforming to Section 1204.0 in lieu of the required vents.
2. Sidewalk elevator hoistways are not required to be vented.

**1609.4 Location of vents:** Vents shall be located in the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open either directly to the outer air or through noncombustible ducts to the outer air; or in the wall or roof of the penthouse or overhead machinery space above the roof, provided that vent openings of at least equivalent area are provided in the floor or floors at the top of the hoistway. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extended to not less than twelve (12) inches below the shaft vent to inhibit the passage of smoke into the machine room.

**1609.5 Area of vents:** Except as herein provided, the area of the vents shall be not less than three and one-half ( $3\frac{1}{2}$ ) per cent of the area of the hoistway nor less than three (3) square feet for each elevator car, and not less than three and one-half ( $3\frac{1}{2}$ ) per cent nor less than one-half ( $\frac{1}{2}$ ) square foot for each dumbwaiter car, in the hoistway, whichever is greater. Of the total required vent area, not less than one-third ( $\frac{1}{3}$ ) shall be of the permanently-open type. Where mechanical ventilation conforming to the mechanical code listed in Appendix B and providing equivalent venting of the hoistway is provided in the overhead elevator machine room, the required vent area may be reduced, provided the following conditions are met.

1. The building is not a hotel, apartment house, hospital or similar building with overnight sleeping quarters.
2. The machine room is so located that it does not have outside exposure.
3. The hoistway does not extend to the top story of the building.
4. The machine room exhaust fan is automatically re-activated by thermostatic means.

**1609.6 Closed vents:** Closed portions of the required vent area shall consist of windows, skylights or duct openings glazed with plain glass not more than one-eighth ( $\frac{1}{8}$ ) inch thick.

**1609.6.1 Skylights:** Skylights used as required vents shall conform to Section 925.3.

**1609.6.2 Windows:** Windows used as required vents shall conform to Section 916.0, except that they shall be glazed with one-eighth ( $\frac{1}{8}$ ) inch plain glass.

### **SECTION 1610.0 ELEVATOR-EXITWAY RESTRICTIONS**

**1610.1 General:** Elevators shall not be accepted as a required element of an exitway. Elevators shall not be installed in a common enclosure with a stairway, and the path of travel on any exitway stairway shall not pass directly in front of any elevator hoistway door.

### **SECTION 1611.0 ELEVATOR AND DUMBWAITER MACHINERY AND EQUIPMENT**

**1611.1 General:** Elevator and dumbwaiter machinery and equipment shall conform to the standard listed in Appendix B.

### **SECTION 1612.0 HOISTWAYS AND RELATED CONSTRUCTION FOR PASSENGER AND FREIGHT ELEVATORS AND DUMBWAITERS**

**1612.1 General:** The construction of hoistways, machine rooms and related construction for passenger and freight elevators and dumbwaiters shall conform with the standards listed in Appendix B.

### **SECTION 1613.0 ELEVATOR OPENING PROTECTIVES**

**1613.1 General:** All hoistway enclosure doors for elevators, dumbwaiters and other hoisting equipment shall be constructed in accordance with the provisions of Article 9 and as herein required.

**1613.2 Fire doors:** Door openings of elevator hoistway enclosures shall be equipped with protective assemblies having a fireresistance rating of not less than one and one-half ( $1\frac{1}{2}$ ) hours or their approved labeled equivalent; except that when the shaft opens into a vestibule enclosed with not less than two (2) hour fireresistance rated construction in which all vestibule openings are protected with assemblies having a fireresistance rating of not less than one (1) hour, the fireresistance rating of the shaftway doors may be reduced to three-quarter ( $\frac{3}{4}$ ) hour. Elevator hoistway fire doors shall not be required to be self-closing.

**1613.3 Hardware:** All hardware on opening protectives shall be of an approved type, installed as tested; except that interlocks, mechanical

elevator door locks and electric contacts and door operating mechanisms of approved types shall be exempt from the fire test requirements.

**1613.4 Door operation on dangerous floors:** Each elevator lobby shall be provided with an approved smoke detector located on the lobby ceiling. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under the manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only. The smoke detector is to operate before the optical density exceeds three-hundredths (0.03) per foot. The detector may serve to close the lobby doors.

**Exception:** Freight elevators located in or at openings into industrial areas.

### SECTION 1614.0 ELEVATOR CAR EMERGENCY SIGNALS

**1614.1 General:** Elevator cars shall be provided with car emergency signals conforming to the standard listed in Appendix B.

### SECTION 1615.0 MANLIFTS

**1615.1 Restricted use:** Manlifts shall be accessible and their use shall be restricted to employees only. They shall comply with the applicable requirements of this article and shall be installed only when permitted by the building official in feed, flour and cereal mills, grain elevators and in similar buildings of other use groups.

**1615.2 Enclosures:** When the clear vertical distance between mounting platform and ceiling guard is less than seven and one-half (7½) feet, the manlift shall be completely enclosed to comply with Section 1609.0 without access openings.

**1615.3 Accessibility:** An entrance to manlifts shall not be provided from any floor or level with a clear ceiling height of less than nine (9) feet, and the minimum clearance between the head pulley and the roof or other overhead obstruction shall be not less than four (4) feet.

**1615.4 Speed:** The speed of manlifts shall not exceed ninety (90) feet per minute.

#### 1615.5 Manlift safeties

**1615.5.1 Manlift manual stops:** An approved manually operated stopping device shall be provided to permit passengers riding on a manlift to control the operation of the lift at all floors and at any level in the travel of the device.

**1615.5.2 Manlift automatic stops:** An approved safety device shall be provided which will automatically stop the lift in the event that a rider



fails to alight at the top landing; but such automatic device shall not be capable of restoring the operating circuit when it has been interrupted for any cause.

**1615.5.3 Secondary manlift stop:** All new installations shall be provided with a secondary safety stop to act immediately after and in the event of a failure of the automatic stop brake or other device required in Section 1615.5.2.

#### **1615.6 Manlift construction**

**1615.6.1 Floor openings:** Floor openings shall be circular and not less than twenty-four (24) inches in dimension from belt to perimeter. The floor openings shall be provided with bevel guards underneath the landing with a slope of not less than forty-five (45) degrees from the horizontal, extending not less than forty-two (42) inches back from the handhold.

**1615.6.2 Guards:** The floor opening shall be protected with a railing or guard of metal or other approved noncombustible material, forty-two (42) inches in height, located not less than twelve (12) inches from the edge of the opening.

**1615.6.3 Entrance and exit:** The entrance and egress to and from the manlift shall be equipped with a gate at all floors and landings, hung to swing away from the opening and located not less than two (2) feet from the floor openings. The landings shall be constructed to provide safe footing and shall be kept clear of obstructions and lighted to an intensity of not less than three (3) foot candles. The runs of the manlift shall be illuminated throughout the entire height to an intensity of not less than one (1) foot candle.

**1615.6.4 Steps:** Manlift steps shall be uniform in size and not less than twelve (12) inches deep from the plane of the belt to the edge of the tread and of adequate strength to support a load of four hundred (400) pounds. The vertical distance between step treads shall be not less than fifteen (15) feet.

**1615.6.5 Belts:** All manlift belts shall be of approved types, not less than twelve (12) inches wide and of adequate strength to support a load of two hundred (200) pounds on each step of one (1) run without loss of traction.

**1615.6.6 Handholds:** Manlift handholds shall be located not less than four (4) nor more than four and two-thirds ( $4\frac{2}{3}$ ) feet above each step tread on both runs of the manlift with a two (2) inch clearance from the belt. Such handholds shall be not less than nine (9) inches in length in the clear.

**1615.7 Final acceptance:** All manlifts shall be subject to acceptance by the building official and periodic tests and inspections as provided in Section 1602.0.



### 1615.8 Manlift instruction signs

**1615.8.1 Landing signs:** Approved signs shall be provided on each landing and stenciled on the belt at approximately eye level above each step giving the following instructions: *For employees only. Face the belt. Use the handhold. To stop, pull rope.*

**1615.8.2 Terminal sign:** The top landing shall be provided with an illuminated warning sign in block letters not less than two (2) inches high which shall be located within easy view of ascending passengers at a level of not more than two (2) feet above the top landing, reading: *Top floor, get off.*

## SECTION 1616.0 INDUSTRIAL LIFTS AND LOADING RAMPS

**1616.1 General:** Except as exempted by Section 1600.0 or as may be otherwise provided by statute, the provisions of this section and Section 1617.0 shall control the design, construction, installation, maintenance and operation of all automotive lifts, industrial lifts and loading dock ramps hereafter installed, relocated or altered in all buildings and structures. All such equipment shall be constructed, operated and maintained in compliance with accepted engineering practice. The purpose of this code is to provide reasonable safety for life and limb. In case of practical difficulty or unnecessary hardship, the building official may grant exceptions from the literal requirements or permit the use of other methods, but only when it is clearly evident that reasonable safety is thereby secured.

### 1616.2 General requirements

**1616.2.1 Markings and labels:** All material lifts and loading ramps shall be marked with the name of manufacturer, model number, serial number, and rated capacity; and such markings shall be legibly stamped or etched on a metal plate which shall be permanently secured in a convenient place for inspection. Such nameplates shall not be obscured, obliterated or changed.

**1616.2.2 Controls:** The controls shall be so located that the operator has a full and unobstructed view of the lift area at all times. All control devices shall be accessible to the operator without exposing him to danger. Alterations or changes shall not be made in the control device, or its manner of use, which will render its normal functioning inoperative.

**1616.2.3 Lift control:** When the device used for controlling the travel of the lift in either direction is not continuous pressure or deadman type, an emergency stop button shall be provided and so located as to be readily accessible to the operator at all times.

### 1616.3 Maintenance

**1616.3.1 Owner responsibility:** The owner or his agent shall be responsible for the care, maintenance, and safe operation of all equipment

covered by this article after the installation thereof and its acceptance by him or its approval by the building official. The owner, or his agent, shall not permit the equipment to be used unless it is, to the best of his knowledge, in safe operating condition.

**1616.3.2 Housekeeping:** The spaces around, or beneath the equipment shall be kept clean; rubbish or oil shall not be allowed to accumulate therein, nor shall any part of this space be used for storage of materials or equipment. All parts, except such parts as require freedom of movement, shall be kept tight at all times. All mechanical working parts shall be kept free of rust, and properly lubricated and adjusted. The owner, or his agent, shall be responsible for inspecting the oil level in all hydraulic systems to insure that it is at, or above, the manufacturer's prescribed minimum level.

**1616.3.3 Lighting:** The entire operating area shall be illuminated to provide a distributed intensity of not less than three (3) foot-candles over the area of operating floor and platform.

**1616.4 Pressure tanks:** All separate tanks for liquid storage under pressure, not an integral part of the cylinder assembly, shall conform to the provisions of ASME code for unfired pressure vessels listed in Appendix B and shall be marked with a securely attached metal label to indicate the approved operating pressure. For hydro-pneumatic systems, the storage capacity shall be such that with the lift in fully elevated position there shall remain not less than three (3) inches of usable oil in the storage tank. Adequate means shall be provided to determine that the oil level in reservoir, with lift in the lowest position, is at or above the safe minimum operating level as prescribed by the manufacturer.

**1616.5 Design and construction:** The construction and installation of all power industrial lifts and loading ramps shall comply with the provisions of this section and the accepted standards listed in Appendix B.

**1616.5.1 Rated load:** The lifting capacity of the lift shall be not less than fifty (50) pounds per square foot (psf) of gross platform area.

**1616.5.2 Platform construction:** The platform and its supports shall be designed for the loads to be transmitted within the strength and deflection limitations herein specified, when one-half ( $\frac{1}{2}$ ) the capacity load is applied as a static center concentration within twelve (12) inches of the loading edge, the lift platform shall not deflect more than one-half ( $\frac{1}{2}$ ) inch at any edge point.

## **1616.6 Platform and hoist protection**

**1616.6.1 Unprotected space not more than five feet:** When the lift rise is such that the unprotected vertical distance from the landing to the bottom edge of the vertical side of the platform is not more than five (5) feet, protection shall be provided as described below.

1. **Toe guards:** A toe guard plate not less than eight (8) inches in width shall be provided on all unprotected sides. It shall be made of steel, not less than No. 11 Manufacturers' Standard Gage (0.120 in.) in thickness, attached flush with the vertical edge of the platform, and slanted inwardly at an angle of approximately thirty (30) degrees from the vertical. Skirts may be used in lieu of toe guards.
2. **Skirts:** For automatic operation, the unprotected sides of the platform shall be provided with metal or wood sheathing or skirts attached to the platform to protect the exposed vertical openings.
3. **Enclosures:** When toe guard or skirt protection is not provided the unprotected sides may be provided with solid or mesh enclosures to the full height of the lift rise. Mesh enclosure shall, by test, reject a two (2) inch ball.

**1616.6.2 Unprotected space more than five feet:** When the unprotected space exceeds that set forth in Section 1616.6.1, protection shall be provided as described below.

1. Sides used for loading or unloading at the lower level shall be protected with skirts as described in Section 1616.6.1, or by a landing gate with electrical contact, or an automatic landing gate.
2. Sides not used for loading or unloading shall be protected with skirts or enclosures as described in Section 1616.6.1.

**1616.6.3 Lift rise more than five and one-half feet:** When the lift rise exceeds five and one-half (5½) feet above the lowest level, additional protection shall be provided as described below.

1. The upper landing shall be provided with a landing gate equipped with mechanical lock and electrical contact.
2. The sides of the platform not used for loading or unloading shall be provided with railings, mesh, or solid enclosures not less than three and one-half (3½) feet high.

**1616.6.4 Surface installations:** When the lift is surface mounted, toe clearance space shall be provided on all unprotected sides. Such toe clearance shall provide not less than three (3) inches vertical and four (4) inches horizontal clearance when the platform is at its lowest position.

**1616.7 Platform protection, loading ramps:** The sides or edges of the loading ramps which rise above the surrounding platform shall be provided with skirt or toe guards protecting the opening under the sides of the ramp.

## **1616.8 Overload protection**

**1616.8.1 Electric-hydraulic operation:** Hydraulic overload protection shall be provided by means of a relief valve that will prevent raising of the elevating device when it is loaded to one hundred twenty-five (125) per cent of rated capacity. The relief valve shall be so located that its operation will not cause the platform to lower.

**1616.8.2 Electric operation:** Electric overload protection shall be provided by means of a thermal cutout or other suitable device.

### SECTION 1617.0 AUTOMOTIVE LIFTS

**1617.1 General:** All electric, hydraulic and hydro-pneumatic automotive lifts shall comply with the requirements of Sections 1606.0 and 1606.1, and the applicable standards listed in Appendix B.

**1617.2 Types:** Lifts shall be classified as semi-hydraulic, full hydraulic or mechanical lifts according to their operation as described in the following Sections 1617.2.1 through 1617.2.3.

**1617.2.1 Semi-hydraulic hydro-pneumatic:** A semi-hydraulic lift is an automotive lift of the plunger type which employs compressed air as the primary lifting and load sustaining agent; such compressed air acts continuously against a column of liquid to provide the lifting and load sustaining effort.

**1617.2.2 Full hydraulic:** A full hydraulic lift is an automotive lift of the plunger type that employs a liquid under pressure as the direct lifting and load sustaining agent. Such a lift is so designed and constructed that the full weight of the load and lifting assembly rests on a continuous column of liquid which extends from the cylinder to the liquid control valve.

**1617.2.3 Mechanical lifts:** A mechanical lift is an automotive lift so designed that the motive power is transmitted to the lifting frame by mechanical means. There are three principal types: cable and drum; rack and pinion; and screw type.

**1617.3 Chassis and axle supports:** Only those chassis and axle supports complying with the requirements of Commercial Standard CS142 listed in Appendix B may be used.

**1617.4 Safeties:** All mechanical automotive lifts shall be equipped with approved safeties as specified in the following Sections 1617.4.1 through 1617.4.3.

**1617.4.1 Limit stop:** Every mechanical automotive lift shall be equipped with an automatic overtravel device to stop the motor or drive machine before the lifting frame reaches safe limits of travel.

**1617.4.2 Holding brake:** When the friction of the gear train of the driving mechanism is insufficient to hold the load, the mechanical automotive lift shall be equipped with a brake or other locking device to automatically hold the lift at any level immediately on failure of the lifting power for any cause.

**1617.4.3 Stopping brake:** When the structural members of the lifting frame are so designed that they interfere with open doors or other projections from the vehicle, the automotive lift shall be provided with a quick acting automatic brake to stop the ascent of the lift in case of emergency.

## 1617.5 Controls

**1617.5.1 Automatic release:** The direct control device shall be of a type that will automatically return itself to the neutral or off position upon release by the operator.

**1617.5.2 Speed control:** A speed control device shall be provided to control the descent of the lift at a speed of not more than twenty (20) feet per minute (fpm) under rated load.

## SECTION 1618.0 CONVEYORS

**1618.1 Enclosures:** All package elevators, boosters or lifts connecting successive floors or levels shall be enclosed in fireresistance rated construction in conformity to the requirements of Sections 1612.0 and 1609.0 and Article 9.

### 1618.2 Opening protectives

**1618.2.1 Plans and specifications:** Whenever conveyor or other material-handling devices are designed to pass through floors, ceilings, partitions or walls, the plans and specifications shall give the necessary details of the opening protectives in respect to location, structural strength and fire-resistance rating.

**1618.2.2 Fire curtains:** Openings in partitions and walls through which conveyors pass shall have automatic fire dampers or curtains to prevent the spread of fire when, in the opinion of the building official, such protection is necessary due to the hazard of operation of the conveyors.

**1618.2.3 Fire doors:** All opening protectives shall meet the fireresistance rating requirements of Article 9 for the location, type of construction and use of the building or structure.

**1618.3 Machinery guards:** All conveying devices shall be manufactured, installed, and guarded in accordance with the American National Standards Institute's Safety Standards for Conveyors and Related Equipment (ANSI B20.1).

**1618.4 Chute enclosures:** All slides and chutes shall be enclosed with fireresistance rated construction or protected with approved automatic shutters of noncombustible construction to insure a full firestop between floors of the building or structure.

**1618.5 Conveyor safeties:** All power-operated conveyors, belts and other material moving devices shall be equipped with automatic limit switches which will shut off the power in an emergency and automatically stop all operation of the conveyors.

## SECTION 1619.0 MOVING STAIRWAYS

**1619.1 General:** All moving stairways and their enclosures shall comply

with the provisions of this section and the safety code. When serving as a required exitway element, moving stairways shall meet the additional requirements of Section 620.0.

### **1619.2 Construction materials**

**1619.2.1 Enclosures:** When not approved as a required exitway element, the stairwell may be open when protected with an exhaust system of ventilation and water curtains as provided in Section 520.0, or with a power-operated shutter conforming to Section 1619.3; except that the machine room shall be enclosed with one (1) hour fireresistance rated construction and shall be properly lighted and ventilated. When such stairway serves as a required exitway element, the complete enclosure including the machine room shall be constructed with a fireresistance rating of not less than two (2) hours complying with the requirements of Section 616.0 for interior stairways.

**1619.2.2 Noncombustible materials:** All parts of the moving stairway and equipment shall be constructed entirely of noncombustible and fire-retardant materials except electrical equipment, wiring, wheels, handrails and the use of one-twenty-eighth ( $\frac{1}{28}$ ) inch wood veneers on balustrades backed-up with noncombustible materials.

**1619.3 Automatic fire shutter:** Unenclosed moving stairways that do not meet the requirements of Article 6 for exitway stairways and which are not protected with an approved exhaust system and automatic water curtain specified in Section 520.0, shall be equipped with a power-operated automatic shutter at every floor pierced thereby, constructed of noncombustible materials with a fireresistance rating of not less than one and one-half ( $1\frac{1}{2}$ ) hours as provided in Section 520.5.

**1619.3.1 Construction:** The shutter shall be so constructed as to close immediately upon the automatic detection of fire or smoke by an approved device and shall completely shut off the well opening. The shutter shall operate at a speed of not more than thirty (30) fpm; and shall be equipped with a sensitive leading edge to arrest its progress when in contact with any obstacle, and to continue its progress on release therefrom.

# ARTICLE 17

## PLUMBING SYSTEMS

### SECTION 1700.0 GENERAL

**1700.1 Scope:** The design and installation of plumbing systems, including sanitary and storm drainage, sanitary facilities, water supplies and storm water and sewage disposal in buildings shall comply with the requirements of this article and accepted engineering practice as defined in the plumbing code listed in Appendix B.

### SECTION 1701.0 PLANS AND SPECIFICATIONS

**1701.1 When required:** Prior to the issuance of any permit, plumbing plans and specifications for the installation, alteration or addition to the plumbing systems of any building, structure or premises shall be submitted to the building official for approval. The plans and specifications shall show in sufficient detail the layout and spacing of fixtures; the size, material and location of all building sewers and drains, storm sewers and drains; and the soil, waste, vent, and water supply piping.

**1701.2 Plans:** Legible plans drawn to a scale of not less than one-eighth ( $\frac{1}{8}$ ) inch to the foot of each floor and of a typical floor shall be filed in triplicate and shall show the complete plumbing system, all plumbing fixtures and all water supply piping, together with building sections showing vertical and diagrammatic elevations of the soil, waste, vent and water supply lines with traps and valves, and the location and size of the public sewer or other disposal system.

**1701.3 Exemptions:** The filing of plans and specifications shall not be required for minor repairs as defined in the plumbing code listed in Appendix B, or for the installation or alteration of plumbing and drainage systems in buildings or structures herein specifically exempted, such as open sheds for storage purposes, isolated private garages without sanitary fixtures, temporary sanitary installations required under the provisions of Article 13 for construction operations, and temporary installations for exhibition purposes when not designed for sanitary use and not directly connected to a sewerage system.



## SECTION 1702.0 SEWER AND WATER SUPPLY DATA

**1702.1 Public sewer:** Plans for new plumbing systems or alterations to existing plumbing systems shall be accompanied by a diagram showing the relative elevation of the lowest fixture and the top of the public sewer referred to the established datum of *[name of jurisdiction]* when such public sewer is available. The plans shall show the size, number and location of all new sewer connections.

**1702.2 Public water main:** When the installation of a water distribution system or the replacement or alteration of a water supply system is contemplated, the plumbing plans shall show the location and sizes of all the water lines and branches involved, the fixtures or other devices to be supplied, and the minimum water pressure in the main in front of the building or structure.

**1702.3 Identical structures:** The same set of plumbing or water supply piping plans and specifications may be used for two (2) or more buildings or structures when the buildings are exactly similar and are located on adjoining lots under the same ownership, provided the applications for permission to construct or alter are filed simultaneously.

## SECTION 1703.0 PERMITS AND CERTIFICATES OF APPROVAL

**1703.1 Approved plans:** Before any work is commenced on plumbing installations which require the submission of plans, a permit shall be secured from the building official and such permit with a stamped and approved copy of the plans shall be available at the construction site at all times.

**1703.2 Amended plans:** All plumbing installations shall be installed in accordance with the plans as approved, and any changes made during construction which are not in conformity to the approved plans shall be resubmitted for approval on amended plans.

**1703.3 Certificate of approval:** After the prescribed tests and final inspection indicate the work complies in all respects with the provisions of the plumbing code listed in Appendix B, a certificate of approval and acceptance shall be issued by the building official.

**1703.4 Notice of commencement and completion:** The building official shall be notified of the commencement of any plumbing work, and when such work is completed or ready for inspection. All such notices shall be confirmed in writing and shall be part of the official record of the application and permit.

**1703.5 Violations:** If work is installed contrary to the approved plans in any essential details, the owner, general contractor, supervising engineer or architect and the master plumber shall all and separately be deemed to be in violation of this code and subject to the penalties pro-



vided in Section 122.0 until amended plans are filed and approved.

**1703.6 Owner performance:** The provisions herein contained shall not prohibit the owner of a building or structure from personally installing the plumbing system in his own residence under the conditions specified in the following Sections 1703.6.1 through 1703.6.5.

**1703.6.1 Approval of plans:** Approval of plans and final approval of the building official shall be obtained.

**1703.6.2 Permit:** A permit shall be secured as herein provided before the work is performed.

**1703.6.3 Legal fees:** All legal fees shall be paid to the jurisdiction.

**1703.6.4 Work:** All work shall be performed by the owner himself in accordance with the provisions of this code.

**1703.6.5 Tests:** The owner shall make application for all required inspections and tests.

## SECTION 1704.0 WATER SUPPLY SYSTEMS

**1704.1 General:** Every building in which people live, work or congregate shall be provided with a supply of clean, cool and potable water in sufficient quantity to maintain all water supply and plumbing fixtures in a safe and sanitary manner; and such other water supplies as may be required for fire protection, air-conditioning and all other service equipment of the building or structure required by this code.

### 1704.2 Public water supply

**1704.2.1 Required capacity:** Where the required capacity of potable water supply is available from public water mains at the site, every building and structure shall be supplied from such mains to provide for all its service equipment.

**1704.2.2 Power pumps:** When power pumps are required in the water supply system of a building or a structure, they shall not pump directly from a city main or from the building supply, but shall be fed through an open surge tank controlled by a balanced ball cock unless otherwise approved by the building official.

**1704.3 Private water supply:** When public water mains are not available, a private source of water supply may be used provided samples are submitted periodically to the health official for analysis and approval and the use of such source of supply has been approved by him and the building official.

### 1704.4 Cross-connected supplies

**1704.4.1 Building service supply:** It shall be unlawful to connect water piping supplied directly from city water mains or other approved sources with or to piping from underground storage tanks or other unapproved

sources; and a cross-connection shall not be made between the potable water distribution system and any portion of waste or soil systems, or fixtures or devices that may contaminate, pollute or otherwise render the water unsafe.

**1704.4.2 Process water:** Water from unapproved sources for industrial processing or for fire protection shall be identified at each outlet with an approved sign stating that the water is unfit and that its use is prohibited for drinking purposes. Piping carrying potable waters shall be identified and distinguished from water piping from unapproved sources by distinctive painting and appropriate signs.

## SECTION 1705.0 EXISTING BUILDINGS AND INSTALLATIONS

**1705.1 Compliance with code:** When alterations are made in an existing building or structure requiring the addition of any two (2) or more plumbing fixtures, or one (1) or more waterflush closets, or when a new bathroom is installed, or a building is remodeled for an extension in size or change in use, in which plumbing work is involved, the new work shall be made to conform to all the applicable sanitary requirements of the plumbing code listed in Appendix B.

**1705.2 Unsafe installations:** Any existing installation of plumbing systems deemed unsafe and dangerous to the public health, in whole or in part, shall be made to comply with all the provisions of this article or as the building official shall determine to be necessary, subject to review in accordance with the provisions of Section 125.0.

**1705.3 Existing drainage nuisances:** Any surface or roof drainage which creates a structural or health hazard, or any other nuisance to the owners or occupants of adjacent premises, or to the public by reason of discharge into, onto or across any adjacent building, premises or public thoroughfare, shall be abated by the owners of the improperly drained area; and the building official shall require the drainage to be disposed of in accordance with the provisions of the plumbing code listed in Appendix B.

### 1705.4 Soil and vent stacks

**1705.4.1 Extension above new building:** When a new building is erected higher than an existing building, windows or other wall openings shall not be located nearer than six (6) feet to an existing soil or vent stack on the lower building unless the owner of the new building makes the necessary provision to extend such soil or vent stacks to a height of not less than three (3) feet above the topmost opening at his own expense and with the approval of the adjoining owner.

**1705.4.2 Extension above existing building:** When the existing adjoining building is of greater height than the new building, the owner of the

structure of greater height may, with the consent of the owner of the new structure, extend all new soil, waste or vent stacks which are located within twenty (20) feet of the common lot line to a level above the higher existing roof.

**1705.4.3 Exemption:** Approved fixed window assemblies of the required fireresistance rated construction which comply with the provisions of Article 9, when permitted in lot line walls, shall not be deemed wall openings within the meaning of this section.



# ARTICLE 18

## PREFABRICATED CONSTRUCTION

### SECTION 1800.0 GENERAL

**1800.1 Scope:** The provisions of this article shall govern the materials and methods of construction of all prefabricated buildings, prefabricated subassemblies and prefabricated building units as herein defined.

**Note. Mass and industrialized production:** Prefabrication as herein used is not restricted to housing for one- and two-family dwellings, but applies to all prefabricated forms of building elements and assembled construction units, intended for both structural and service equipment purposes in all buildings of all use groups. The provisions of this article are supplemental to the structural, mechanical and fireresistance rating requirements of this code. Prefabrication covers the precutting and assembling of individual elements either in the shop or at the site before erection in the building structure. Prefabricated shop assemblies may be shipped in structurally complete units ready for installation in the building structure or in knock-down and packaged form for assembly at the site. There is not a distinction between the application of these code requirements for controlled or ordinary materials as defined in Sections 201.0, 719.0 and 800.0, and either prefabricated or at-site construction. However, the use of controlled materials procedure permits greater latitude for the development of industrialized shop production methods.

**1800.2 Approved materials and methods:** The use of all materials or methods of construction which meet the specified strength, durability, sanitary and fireresistance rating requirements of this code and accepted engineering practice as listed in Appendix B shall be permitted.

**1800.3 New materials:** All new materials or assemblies not specifically provided for shall be tested and evaluated in accordance with the provisions of this code; or the building official may accept duly authenticated Research Reports from the Building Officials and Code Administrators International or from other recognized authoritative sources complying with the approved rules to assist him in his determination.

**1800.4 At-site construction:** The provisions of this article shall not be

deemed to prohibit at-site construction and erection of buildings or structures when designed in compliance with the provisions of this code and the minimum requirements prescribed in this article.

**1800.5 Conflicting laws:** Nothing herein contained shall be deemed to nullify any provisions of the zoning laws or any other statute or legally adopted rule pertaining to building construction of [*name of jurisdiction*] in respect to the location, use, height or area of a building and type of construction, except as may be specifically exempted in these provisions; nor shall anything herein contained have the effect of increasing working stresses or reducing egress facilities and health provisions as prescribed in this code.

### SECTION 1801.0 PLANS AND SPECIFICATIONS

**1801.1 Application:** Complete legible dimensioned drawings to a scale of not less than one-eighth ( $\frac{1}{8}$ ) inch per foot and specifications covering every type of prefabricated construction complying with the administrative provisions of Section 112.0 shall be submitted to the building official for approval. Such application shall describe all essential elements of the structure or assembly, identify such materials as the building official may designate with the name of manufacturer, trade name, commercial grade, manufacturing process or chemical composition when necessary, and shall include all required data of the physical properties of the component materials.

**1801.2 Plot diagram:** A plot plan complying with Section 112.6 shall be filed for each individual building or structure.

**1801.3 Mechanical plans:** Mechanical plans in sufficient detail for the installation of heating, cooking, electrical, ventilating, air-conditioning, sanitary and all other service equipment, piping and accessories shall be submitted to the building official with the application for general approval of the design; or, if not included in the general application for approval, such information shall be furnished for each specific installation.

**1801.4 Piping, electric wiring and accessories:** The design shall include provision for all installations of piping, wiring and accessories for service equipment to be installed either in the shop or at the site.

**1801.5 Integral accessories:** When unit service equipment is furnished with and forms an integral part of the prefabricated subassembly, the construction shall be preformed to accommodate accessory conduits, piping, ducts, outlet boxes and fittings; and material essential to the structural strength of the unit or assembly shall not thereafter be removed from structural elements during installation on the site.

**1801.6 Service equipment requirements:** All service equipment shall comply with the requirements of Article 10 for heating, Article 12 for fire protection, Article 15 for electrical, Article 17 for plumbing, and

the mechanical code listed in Appendix B for air-conditioning and ventilating systems and equipment.

## **SECTION 1802.0 TESTS OF PREFABRICATED ASSEMBLIES**

**1802.1 General:** When not capable of design by accepted engineering analysis, all prefabricated assemblies or subassemblies constructed as in practice shall be subjected to the unit assembly tests prescribed in Articles 7 and 8 and the test standards listed in Appendixes C, D, E, F and G. All assembly tests shall meet the strength requirements of Section 803.0 within the limits of deflection therein provided.

## **SECTION 1803.0 EVALUATION AND FOLLOW-UP INSPECTION SERVICES**

**1803.1 Evaluation report:** Prior to the approval of a closed prefabricated assembly and issuance of a building permit, the building official shall require the submittal of an evaluation report of each prefabricated assembly, indicating the complete details of the assembly, including a description of the assembly and its components, the basis upon which the assembly is being evaluated, test results and similar information, and data necessary for the building official to determine conformance with this code.

**1803.2 Evaluation service:** The building official may designate the Evaluation Service of the Building Officials and Code Administrators International or other independent qualified agency as the evaluation agency and review that agency's evaluation report for adequacy and conformance to this code.

**1803.3 Follow-up inspection:** Except where all assemblies and subassemblies, service equipment and accessories are readily accessible for complete inspection at the site without disassembly or dismantling, the building official may designate the Follow-up Inspection Service of the Building Officials and Code Administrators International or another independent qualified inspection agency to conduct the frequency of in-plant inspections necessary to reasonably assure conformance to the approved evaluation report. The inspection agency shall furnish the building official with the follow-up inspection manual and a report of inspections upon request and the product shall have an identifying label permanently fixed to the product indicating that factory inspections have been performed.

**1803.4 Test and inspection records:** All required test and inspection records shall be accessible to the building official at all times during the fabrication of the unit or subassembly and the erection of the building; or such records as the building official may designate shall be filed with him.

**1803.5 Fees:** All fees associated with the Evaluation and Follow-up Inspection Services shall be borne by the applicant.

## SECTION 1804.0 PREFABRICATED UNITS

**1804.1 General:** Approved prefabricated individual units for use in floor, roof, ceiling or wall construction which are designed to meet all prescribed structural provisions of Articles 7 and 8, including connection and anchorage details, may be used in all at-site construction types and building use groups within the height, area and fireresistance rating limitations of Tables 214 and 305.

## SECTION 1805.0 EXISTING SYSTEMS AND APPROVALS

**1805.1 Existing approvals:** Any material, appliance, form or system of construction heretofore legally approved may be used for the purposes and within the limitations for which it was approved, provided such use is not detrimental to the safety of the public or is not specifically prohibited by the provisions of this code.

**1805.2 Materials already fabricated:** The use of any material already fabricated or of any construction already erected under a heretofore legally issued permit of the building official shall be permitted; but the continuation of any construction erected in violation of any statute or legally adopted rule in force at the time of erection shall be prohibited.

## SECTION 1806.0 APPROVALS BASED ON DESIGN

**1806.1 Engineering analysis:** When capable of design by accepted engineering analysis, any prefabricated structural element or combination of elements shall be approved by the building official when the design is based on the working loads and working stresses provided in Articles 7 and 8 and Appendix K.

### 1806.2 Ordinary materials

**1806.2.1 Average working stress:** When the character of construction permits site inspection by the building official, and all prefabricated assemblies and subassemblies are readily accessible for field inspection, the use of ordinary material with the average working stresses prescribed in Appendix K shall be permitted in prefabricated construction.

**1806.2.2 Field inspection:** When ordinary materials are used, field erection and installation of prefabricated units and service equipment at the site shall be inspected by the building official or he may accept the report of a qualified licensed engineer or architect in respect thereto. All prefabricated subassemblies shall be certified by the authorized representative of the manufacturer for compliance with this code.

**1806.3 Expert services:** When a system of construction involves unusually intricate design analysis, the building official may require the submitter to retain a competent expert to assist in his determination; or he



may accept the recommendations of Building Officials and Code Administrators International, Inc., in respect thereto.

**1806.4 Check tests:** When there is reasonable doubt as to the adequacy of the construction or accessory details which are based on design, the building official may require check tests of assembled units as specified in Section 701.3, or he shall accept certified reports of such tests from accredited testing authorities.

## SECTION 1807.0 APPROVALS BASED ON TESTS

**1807.1 Tests required:** When not capable of design by accepted engineering analysis, every system of prefabricated building, sub-assembly or unit and its connections shall be subjected to the tests and conditions of approval prescribed by Article 8, or to any other tests acceptable to the building official that simulate the actual loads and conditions of application that the completed structure will be required to resist in normal use; or certified reports of such tests conducted by an approved and recognized testing authority shall be accepted by the building official, provided such tests meet the requirements of this code. The costs of all investigations and tests shall be paid by the submitter.

**1807.2 Field connections:** All field splices and structural connections of floor, wall, ceiling and roof subassemblies shall be of sufficient strength to transmit two and one-half ( $2\frac{1}{2}$ ) times the design live loads without failure, and shall be so constructed as to insure weather-tightness in exterior wall and roof panels.

**1807.3 Weather resistance:** In the absence of reliable experience records, the building official may require accelerated tests on the prefabricated assemblies as prescribed by Article 8 and Appendix F to determine durability, weather tightness and weather resistance; or he shall accept certified reports of approved and recognized testing authorities in respect thereto.

**1807.4 Comparative tests:** When not available from existing authoritative test data, the building official may require comparative tests of traditional standard construction of the dimensions and proportions required in this code for the proposed use.

## SECTION 1808.0 MATERIALS, DIMENSIONS AND METHODS OF FABRICATION

**1808.1 Accepted standards:** The provisions of Articles 7 and 8 and the approved standards listed in the appendices shall control the selection of materials, design and fabrication of all prefabricated structures; or in the absence of such standards of accepted engineering practice, the minimum requirements shall be regulated by the approved rules.

**1808.2 Below-grade construction:** The prefabricated construction cov-

ered by these provisions shall not be permitted in cellar, basement or part-story below grade unless specifically approved by the building official. All such subsurface structures shall be constructed of approved masonry, or reinforced concrete complying with Article 8; or the subgrade walls and floors shall be constructed of approved durable, water-resisting materials of adequate strength.

**1808.3 Exterior and interior finish:** When a fireresistance rating is specified, framed wall and partition assemblies shall be veneered, surfaced or constructed with approved materials to secure the specified fireresistance rating required by Article 2 for the construction type and use group of the building or structure within the limitations of Tables 214 and 305. When not required to meet fireresistance rating requirements, interior wall and partition surfaces shall be constructed to comply with Section 854.10.

**1808.4 Exterior protection:** All steel or other corrodible siding and weather boarding exposed to the weather shall be protected from corrosion or shall be manufactured from corrosion-resistive metal to comply with Section 854.0. In structures two (2) stories or more in height, the weather boarding shall be constructed of noncombustible or approved protected-combustible materials as regulated by Tables 214 and 305.

**1808.5 Condensation and weather resistance:** Exterior frame walls of buildings shall be constructed or ventilated to avoid condensation and leakage of moisture to comply with Sections 854.4 and 854.9.

**1808.6 Roofing:** All roof covering shall be of approved types meeting the requirements of Sections 903.3 and 926.0.

**1808.7 Connections:** All connections and accessories shall be proportioned to transmit the loads and stresses imposed in accordance with accepted engineering practice and as provided in Section 1807.2.

**1808.8 Waterproofing, ratproofing and termite protection:** All installations shall comply with the provisions of Sections 872.0 for waterproofing, 873.0 for ratproofing and 874.0 for termite protection.

## **SECTION 1809.0 LIGHT GAGE STEEL FRAME CONSTRUCTION**

**1809.1 General:** The fabrication of light gage steel frame structures shall comply with the requirements of Sections 827.0 governing formed steel and 828.0 governing steel joists.

## **SECTION 1810.0 LIGHT WOOD FRAME CONSTRUCTION**

**1810.1 General:** The fabrication of light wood frame structures shall comply with the requirements of Section 854.0.

## SECTION 1811.0 LIGHT REINFORCED CONCRETE FRAME CONSTRUCTION

**1811.1 General:** The fabrication of light reinforced concrete frame structures shall comply with the provisions of Sections 840.0 to 848.0 inclusive.

**1811.2 Shop procedure and test reports:** The design and manufacture of all precast concrete structural units and assemblies shall follow the procedures specified for ordinary or controlled materials. Tests shall be made at the place of manufacture to determine the water-cement ratio and the aggregate proportions required to maintain the design strength for every change in material and manufacturing conditions. The shop report shall cover the quality of concrete materials and the total amount of water used, the mixing and placing of concrete and the installation of reinforcement, together with a record of the temperatures and means of protection provided for the concrete while curing.

**1811.3 Test cylinders:** Not less than three (3) compression specimens shall be tested at the age of shipment of the prefabricated member for each one hundred (100) yards of concrete. The test cylinders shall develop an average compressive strength at the age of shipment of the prefabricated member of not less than twice the compressive stress used in the design.

## SECTION 1812.0 LIGHT REINFORCED GYPSUM FRAME CONSTRUCTION

**1812.1 General:** The fabrication of light reinforced gypsum frame structures shall comply with the requirements of Section 849.0.

**1812.2 Test cylinders:** Not less than three (3) compression specimens for each one hundred (100) yards of gypsum concrete cured and stored under the same conditions as the prefabricated member shall be tested at the age of shipment. The test specimens shall develop an average compressive strength at the time of shipment not less than twice the stress used in the design.

**1812.3 Protection of units:** Continual protection from the weather and from contact with water shall be furnished for the prefabricated units or subassemblies during shipment, storage and after erection in the structure.

**1812.4 Handling and erection stresses:** All units shall be metal bound or otherwise reinforced for handling stresses, and precaution shall be observed to provide temporary anchorage to the structural frame during erection and to prevent damage or destruction from the weather and wind before final completion of the installation.

**1812.5 Grade construction:** The ventilated space underneath first floor construction shall be not less than two (2) feet high and the underside

of first floor construction shall be dampproofed with an approved protective covering.

### **SECTION 1813.0 FIRERESISTANCE RATING AND FIRESTOPPING**

**1813.1 General:** Provision shall be made to comply with all the requirements of Sections 875.0 and 919.0 for fire protection and firestopping, and the provisions for fireresistance rated construction of Article 9.

### **SECTION 1814.0 LIGHT AND VENTILATION**

**1814.1 General:** Means of light and ventilation shall comply with the provisions of Article 5 governing habitable and occupiable rooms, bathrooms and toilet rooms, attic and crawl spaces.

### **SECTION 1815.0 EGRESS FACILITIES**

**1815.1 General:** The requirements of Article 6 shall control the number, size, and construction of all means of egress as specified therein for the use and occupancy of the building.

**1815.2 Fireresistance rating requirements:** Where fireresistance rated construction is required, the fireresistance ratings shall be regulated by Table 214 for the respective type of construction. Required exitways, public hallways, interior trim and finish shall be constructed to comply with Article 9.

### **SECTION 1816.0 PLUMBING, PIPING AND SANITARY EQUIPMENT**

**1816.1 General:** All installations of plumbing, drainage and gas piping systems shall comply with the provisions of Article 17 and the plumbing code listed in Appendix B.

### **SECTION 1817.0 HEATING AND AIR-CONDITIONING**

**1817.1 General:** The applicable provisions of Article 10 and the mechanical code listed in Appendix B shall control the construction and installation of chimneys, flues and heating appliances as therein provided for liquid and solid fuel and gas-fired heating equipment and service-water heaters; and the provisions of the mechanical code listed in Appendix B shall apply for air-conditioning installations.

# ARTICLE 19

## LIGHT-TRANSMITTING PLASTIC CONSTRUCTION

### SECTION 1900.0 GENERAL

**1900.1 Scope:** The provisions of this article shall govern the quality and methods of application of plastics for use as light-transmitting materials in buildings and structures. When used as interior finish, plastic materials shall meet the requirements of Section 920.0.

**1900.2 Approved materials:** The use of all plastics which meet the strength, durability, sanitary and fireresistive requirements of this code, ASTM D635 Standard Method of Test for Flammability of Self-Supporting Plastics, ASTM D374 Method of Test for Thickness, ASTM D1929 Method of Test for the Ignition Properties of Plastics, and ASTM D2843 Standard Method of Test for Measuring the Density of Smoke from the Burning or Decomposition of Plastics as listed in Appendix C, and ASTM E84 Method of Test for Surface Burning Characteristics of Building Materials in Appendix G, shall be permitted subject to the limitations of this article.

#### 1900.2.1 Definitions:

**Approved plastic:** An approved plastic shall be any thermoplastic, thermosetting, or reinforced thermosetting plastic material which has a self-ignition temperature of six hundred fifty (650) degrees F. or greater when tested in accordance with ASTM D1929 Method of Test for Ignition Properties of Plastics listed in Appendix C, a smoke density rating no greater than four hundred fifty (450) when tested in the way intended for use by ASTM E84 listed in Appendix G or a smoke density rating no greater than seventy-five (75) when tested in the thickness intended for use according to ASTM D2843 Standard Method of Test for Measuring the Density of Smoke from the Burning or Decomposition of Plastics listed in Appendix C, products of combustion no more toxic than those of untreated wood when burned under similar conditions, and which meet one of the following combustibility classifications:

Class C-1: Plastic materials which have a burning extent of one

(1) inch or less when tested in nominal point sixty thousandths (.060) inch thickness, or in the thickness intended for use, by ASTM D635 listed in Appendix C; or

**Class C-2:** Plastic materials which have a burning rate of two and one-half (2.5) inches per minute or less when tested in nominal point sixty thousandths (.060) inch thickness, or in the thickness intended for use, by ASTM D635.

**Light-diffusing system:** A suspended construction consisting in whole or in part of lenses, panels, grids, or baffles suspended below independently mounted electrical lighting sources.

**Plastic glazing:** Plastic materials which are glazed or set in frame or sash and not held by mechanical fasteners which pass through the glazing material.

**Plastic roof panels:** Plastic materials which are fastened to structural members or to structural panels or sheathing and which are used as light-transmitting media in roofs.

**Plastic wall panels:** Plastic materials which are fastened to structural members or to structural panels or sheathing and which are used as light-transmitting media in exterior walls.

**Glass fiber reinforced plastic:** Plastic reinforced with glass fiber having not less than twenty (20) per cent of glass fibers by weight.

**Thermosetting materials:** A plastic material which is capable of being changed into a substantially non-reformable product when cured.

**Thermoplastic material:** A plastic material which is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

**1900.2.2 Application for approval:** Applicants for approval of a plastic material shall furnish, in accordance with Section 804.0, all necessary technical data required by the building official. The data may include the chemical composition; pertinent physical, mechanical and thermal properties such as fireresistance, flammability, and flamespread; weather resistance; electrical properties; products of combustion and coefficients of expansion.

**1900.3 Identification:** All plastic materials approved for use under this code shall be identified by the trade formula number or name or other acceptable identification. Each unit or package shall bear the approval number or other identification mark of the approving authority.

## SECTION 1901.0 DESIGN AND INSTALLATION

**1901.1 Structural requirements:** All plastic materials and their assemblies shall be of adequate strength and durability to withstand the loads and forces specified in Article 7 for their approved use.

**1901.2 Connections and supports:** All fastenings, connections and supports shall be proportioned to safely transmit two and one-half ( $2\frac{1}{2}$ ) times the design live load. Adequate allowance shall be made in the fastenings and supports for differential expansion and contraction of the connected materials.

## SECTION 1902.0 GLAZING OF UNPROTECTED OPENINGS

**1902.1 Use in Type 4B construction:** Doors, sash and framed openings which are not required to be fireresistance rated may be glazed with approved plastic materials in buildings of Type 4B (unprotected, frame) construction.

**1902.2 Use group F:** In all types of construction of use group F (factory and industrial), doors, sash and framed openings which are not required to be fireresistance rated may be glazed with approved plastic materials.

**1902.3 Other classes of construction and use group:** In other classes of construction and use, such openings not required to be fireresistance rated by Section 914.0 may be glazed or equipped with approved plastic materials subject to the requirements listed below.

1. The area of such glazing shall not exceed twenty-five (25) per cent of the wall face of the story in which it is installed (see Section 1902.4).
2. The area of a unit or pane of glazing installed above the first story shall not exceed sixteen (16) square feet and the vertical dimension of a unit or pane shall not exceed four (4) feet. There shall be a minimum three (3) feet vertical spandrel wall between stories.
3. Approved plastics shall not be installed more than seventy-five (75) feet above grade level.
4. Approved thermoplastic materials may be installed in areas up to fifty (50) per cent of the wall area of each story in structures less than one hundred fifty (150) feet in height which are provided on each floor above the first floor with continuous architectural projections constituting an effective fire canopy extending at least three (3) feet from the surface of the wall in which the glazing is installed. The size and the dimensions of individual units shall not be limited in such installations except as required to meet structural loading requirements.

**1902.4 Automatic fire suppression:** When a complete approved automatic fire suppression system is provided in the building, the permissible area of glazing permitted by Section 1902.3 (1) may be increased one hundred (100) per cent.

## SECTION 1903.0 EXTERIOR PANEL WALLS

**1903.1 General:** Approved plastic materials may be used as wall

panels, in exterior walls not required to have a fireresistance rating (except in use groups A-1, A-2, H and I) subject to the requirements listed in the following Sections 1903.1.1 through 1903.3.

**1903.1.1 Installation:** Exterior wall panels installed as provided herein shall not alter the type-of-construction classification of the building.

**1903.1.2 Height limitation:** Approved plastics shall not be installed more than seventy-five (75) feet above grade level, except as allowed by Section 1903.2.

**1903.1.3 Area limitation and separation:** Area limitation and separation requirements of exterior wall panels shall be as provided in Table 1903.

**Table 1903**  
**AREA LIMITATION AND SEPARATION REQUIREMENTS FOR PLASTIC WALL PANELS<sup>1</sup>**

Fire separation (ft.)	Class of plastic	Max. % area of ext. wall in plastic panels	Max. sq. ft. single area	Minimum separation of panels (ft.)	
				Vertical	Horizontal
6 ft. or less	—	NP <sup>3</sup>	NP	—	—
6 ft. or more but less than 11 ft.	C1	10	50	8	4
	C2	NP	NP	—	—
11 ft. or more but less than 30 ft.	C1	25	90	6	4
	C2	15	70	8	4
Over 30	C1	50	Not limited	3 <sup>2</sup>	0
	C2	50	100	6 <sup>2</sup>	3

**Note 1.** See Section 1903.3 for combination of glazing and wall panel areas permitted.

**Note 2.** See Section 1903.1.5.

**Note 3.** Not permitted.

**1903.1.4 Spandrel separation:** Vertical spandrel wall separation between stories shall be as follows:

1. three (3) feet for Class C1 plastic wall panels, and
2. four (4) feet for Class C2 plastic wall panels.

**1903.1.5 Fire canopies:** In structures which are provided, on any floor above the first, with continuous architectural projections constituting an effective fire canopy extending at least thirty-six (36) inches from the surface of the wall in which plastic wall panels are installed, there need not be vertical separation at that floor except that provided by the vertical thickness of the projection.

**1903.2 Automatic fire suppression:** When a complete approved automatic fire suppression system is provided in the building, the maximum per cent area of exterior wall in plastic panels and the maximum square feet of single area given in Table 1903 may be increased one hundred (100) per cent but the area of plastic wall panels shall not exceed fifty



(50) per cent of the wall area. These uses shall be exempt from height limitations.

**1903.3 Combinations of glazing and wall panels:** Combinations of plastic glazing and plastic wall panels shall be subject to the area, height and percentage limitations, and separation requirements applicable to the class of plastics as prescribed for wall panel installations.

## SECTION 1904.0 ROOF PANELS

**1904.1 General:** Approved plastic roof panels may be installed (except in use groups A-1, A-2, A-3, H and I) as follows:

1. in roofs of buildings protected by a complete approved automatic fire suppression system;
2. where the roof is not required to have a fireresistance rating by Table 214; or
3. where the roof panels meet the requirements for roof coverings of the particular occupancy group.

**1904.2 Separations:** Individual roof panels shall be separated from each other by a distance of not less than four (4) feet measured in a horizontal plane.

**1904.3 Location:** Where exterior wall openings are required to be fire-resistance rated by Section 914.0, a roof panel or unit shall not be installed within six (6) feet of such exterior wall.

**1904.4 Area limitations:** Roof panels or units shall be limited in area, and the aggregate area of panels shall be limited by a percentage of the floor area of the room or space sheltered in accordance with Table 1904.

**Table 1904**  
**AREA LIMITATIONS FOR ROOF PANELS**

Class of plastic	Maximum area individual unit of panel (sq. ft.)	Maximum aggregate area (% of floor area)
C1	300	30
C2	100	25

**1904.5 Exceptions:** The uses listed below shall be exempt from the requirements of Section 1904.4.

1. One (1) story buildings not more than sixteen (16) feet in height and not exceeding twelve hundred (1200) square feet in area and not closer than eleven (11) feet to another building are exempt from the limitations of Section 1904.4.
2. Low hazard use buildings such as swimming pool shelters, green-houses, etc., are exempt from the area limitations of Section 1904.4

provided the buildings do not exceed five thousand (5,000) square feet in area and are not closer than eleven (11) feet to the property line or adjacent buildings.

3. Roof coverings over terraces and patios of one- and two-family dwellings shall be permitted with approved plastics.

## SECTION 1905.0 SKYLIGHT ASSEMBLIES

**1905.1 Skylight assemblies:** Skylight assemblies may be glazed with approved plastic materials (except in use group H) in accordance with the following provisions.

**1905.1.1 Mounting:** The plastic shall be mounted above the plane of the roof on a curb constructed consistent with the requirements for the type of construction classification, but at least four (4) inches above the plane of the roof. Edges of plastic skylights or domes shall be protected by metal or noncombustible material.

**1905.1.1.1 Dome-shape:** Dome-shape skylights shall rise above the mounting flange a minimum distance equal to ten (10) per cent of the maximum span of the dome, but not less than five (5) inches.

**1905.1.2 Maximum area of skylight units:** Each skylight unit shall have a maximum area within the curb of one hundred (100) square feet.

**1905.1.3 Aggregate area of skylights:** The aggregate area of skylights shall not exceed thirty-three (33) per cent when Class C-1 materials are used, and twenty-five (25) per cent when Class C-2 materials are used, of the floor area of the room or space sheltered by the roof in which they are installed.

**1905.1.4 Separation:** Skylights shall be separated from each other by a distance of not less than four (4) feet measured in a horizontal plane.

**1905.1.5 Location:** Where exterior wall openings are required to be fireresistance rated by Section 914.0, a skylight shall not be installed within six (6) feet of such exterior wall.

**1905.1.6 Exceptions:** a) Except for use groups H and I, the aggregate area of approved plastic skylights may be increased one hundred (100) per cent beyond the limitations set forth in Section 1905.1.3 if the skylights are used as a fire venting system, or if the building is equipped with a complete approved automatic fire suppression system. b) The provisions of 1905.1 need not be applied if the building on which the skylights are located is not more than one (1) story in height, the building has an exterior separation from other buildings of at least thirty (30) feet and the room or space sheltered by the roof is not classified in a group of high hazard or institutional uses or as a means of egress, or the plastic material meets the fireresistive requirements of the roof.

**1905.1.7 Combinations of roof panels and skylights:** Combinations of plastic roof panels and skylights shall be subject to the area and percentage limitations and separation requirements applicable to roof panel installations.

## SECTION 1906.0 LIGHT-DIFFUSING SYSTEMS

**1906.1 General:** Light-diffusing systems shall not be installed in use groups H and I, nor in exitways, unless protected with a fire suppression system. Plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible hangers. Hangers shall be at least No. 12 Steel Wire Gage (0.106 inch) galvanized wire or equivalent.

**1906.2 Installation:** Approved plastic diffusers shall comply with Section 920.0 (interior finish) unless the plastic panels will fall from their mountings before igniting and at an ambient temperature of at least two hundred (200) degrees F. below their ignition temperature. The panels must, however, remain in place at an ambient room temperature of one hundred seventy-five (175) degrees F. for a period of not less than fifteen (15) minutes.

**1906.3 Size limitations:** Individual panels or units shall not exceed ten (10) feet in length nor thirty (30) square feet in area.

**1906.4 Fire suppression system:** In buildings having a complete approved automatic fire suppression system, plastic light-diffusing systems shall have sprinklers both above and below unless the system has been specifically approved for sprinkler installation only above the light-diffusing system. Areas of light-diffusing systems shall not be limited if properly protected by an approved fire suppression system.

**1906.5 Electrical lighting fixtures:** Plastic light-transmitting panels and light-diffuser panels installed in approved electrical lighting fixtures shall comply with Section 920.0 unless the plastic panels meet the requirements of Section 1906.2. The area of approved plastic materials when used in required fire exits or corridors shall not exceed thirty (30) per cent of the aggregate area of the ceiling in which they are installed, unless the occupancy is protected by an approved fire suppression system.

## SECTION 1907.0 PARTITIONS

**1907.1 General:** Approved light-transmitting plastics may be used in or as partitions provided the requirements of the occupancy class as given in Section 920.0 are met. Such partitions may be installed as provided in Section 909.3.

## SECTION 1908.0 BATHROOM ACCESSORIES

**1908.1 Use of plastics:** Approved plastics shall be permitted as glazing

in shower stalls, shower doors, bathtub enclosures, and similar accessory units (see Section 857.5.6).

#### **SECTION 1909.0 AWNINGS AND SIMILAR STRUCTURES**

**1909.1 General:** Approved light-transmitting plastics may be used on awnings and similar structures in conformity with general performance provisions of other sections of the code.

#### **SECTION 1910.0 GREENHOUSES**

**1910.1 General:** Approved light-transmitting plastics may be used in lieu of plain glass in greenhouses.

# ARTICLE 20

## ENERGY CONSERVATION

### SECTION 2000.0 GENERAL

**2000.1 Scope:** The provisions of this article regulate the design and construction of the exterior envelopes and selection of HVAC, service water heating, electrical distribution and illuminating systems and equipment required for the purpose of effective use of energy and shall govern all buildings and structures, or portions thereof, hereafter erected that provide facilities or shelter for human occupancy.

**Exceptions:**

1. Buildings and structures, or portions thereof, which are neither heated nor cooled.
2. Buildings and structures, or portions thereof, whose peak design rate of energy usage is less than one (1) watt per square foot or three and four-tenths (3.4) Btuh per square foot of floor area for all purposes.

**2000.2 Other standards:** Compliance with the applicable provisions of the ASHRAE Standard 90 listed in Appendix B shall be deemed to meet the requirements of this article, unless otherwise specifically provided herein.

### SECTION 2001.0 PLANS AND SPECIFICATIONS

**2001.1 General:** Plans, specifications and necessary computations shall be submitted to indicate conformance with this section and other applicable sections of this code, the mechanical code and the plumbing code listed in Appendix B.

**2001.2 Details:** The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed, including but not limited to: exterior envelope component materials, U values of the respective elements including insulation, R values of insulating materials, size and type of apparatus and equipment, equipment and system controls and other pertinent data to indicate conformance with the requirements herein.

## SECTION 2002.0 EXTERIOR ENVELOPE REQUIREMENTS

**2002.1 General:** The intent of this section is to provide minimum requirements for exterior envelope construction in the interest of energy conservation. Calculation and measurement procedures and information contained in the ASHRAE Standard 90 listed in Appendix B shall be used, except where otherwise noted, to determine conformance with the requirements herein, in accordance with recognized standards.

In addition to the criteria set forth in this article, the proposed design may take into consideration the thermal mass of the building in considering energy conservation.

**2002.1.1 Thermal performance:** All building and structures that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components.

The required thermal transmittance value ( $U_o$ ) of any one component, such as roof/ceiling, wall or floor may be increased and the  $U_o$  value for other components decreased provided that the overall heat gain or loss for the entire building envelope does not exceed the total resulting from conformance to the required  $U_o$  values.

**2002.1.2 Different requirements:** A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements of the exterior envelope as provided in this section when requirements differ.

**2002.1.3 Exterior walls:** For the purpose of this article the gross area of exterior walls consists of all opaque wall areas, including foundation walls above grade, peripheral edges of floors, window areas including sash, and door areas, where such surfaces are exposed to outdoor air and enclose a heated or mechanically cooled space.

**2002.1.4 Roof assembly:** For the purpose of this article a roof assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thereby creating a building transmission heat loss or gain, where such assembly is exposed to outdoor air and encloses a heated or mechanically cooled space.

**2002.1.4.1 Gross roof area:** The gross area of a roof assembly consists of the total interior surface of such assembly, including skylights, exposed to the heated or mechanically cooled space.

**2002.1.4.2 Ceiling plenums:** Where air ceiling plenums are employed, the roof/ceiling assembly shall:

- a. For thermal transmittance purposes not include the ceiling proper nor the plenum space as part of the assembly, and
- b. For gross area purposes be based upon the interior face of the upper plenum surface.

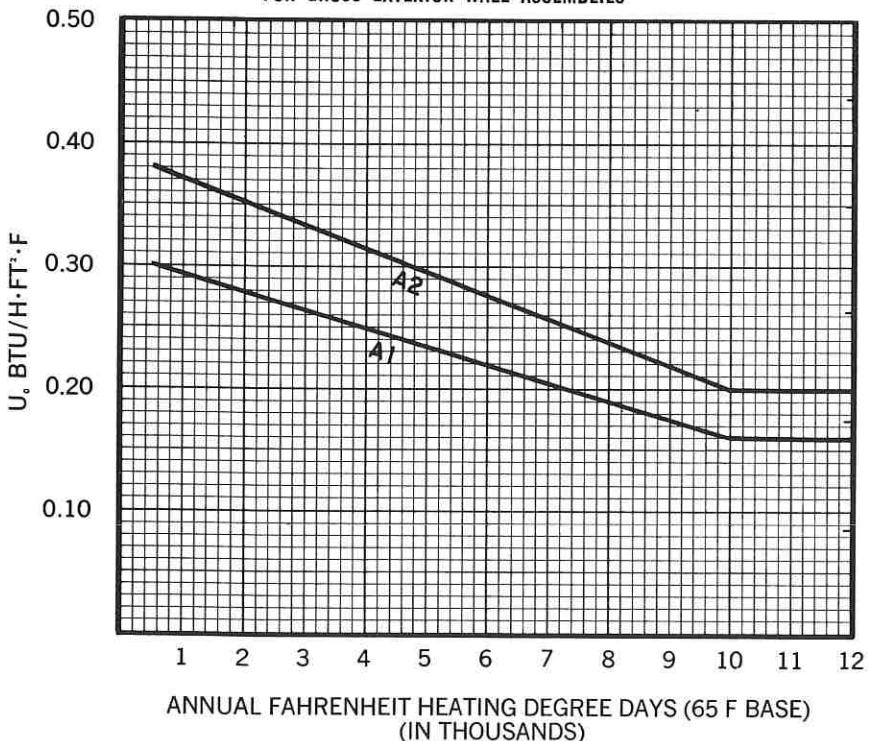
**2002.2 Criteria for residential buildings:** The requirements herein shall apply to all buildings and structures or portions thereof of use group R (residential) that are heated or mechanically cooled when not more than three (3) stories in height.

**2002.2.1 Walls:** The gross area of exterior walls above grade, including foundation walls, shall have a combined thermal transmittance value ( $U_o$ ) not exceeding those specified in the following Figure 2002.2.1a.

**Exceptions:**

1. In locations with less than five hundred (500) Heating Degree Days there shall not be a maximum  $U_o$  requirement if only heating is provided and the  $U_o$  shall be 0.30 maximum if the building is mechanically cooled.
2. The opaque exterior wall areas may be constructed having thermal transmittance ( $U$ ) values in conjunction with glazed opening areas in accordance with Figures 2002.2.1b and 2002.2.1c.

Figure 2002.2.1a  
MAXIMUM ALLOWABLE  $U_o$  VALUES  
FOR GROSS EXTERIOR WALL ASSEMBLIES



\*As specified in Chapter 43 of the ASHRAE Handbook-Systems listed in Appendix B.

Note 1: Line A1 inside graph denotes detached one and two family dwellings.

Note 2: Line A2 inside graph denotes all other residential buildings not more than three (3) stories in height.

Figure 2002.2.1b  
SINGLE GLAZED OPENINGS

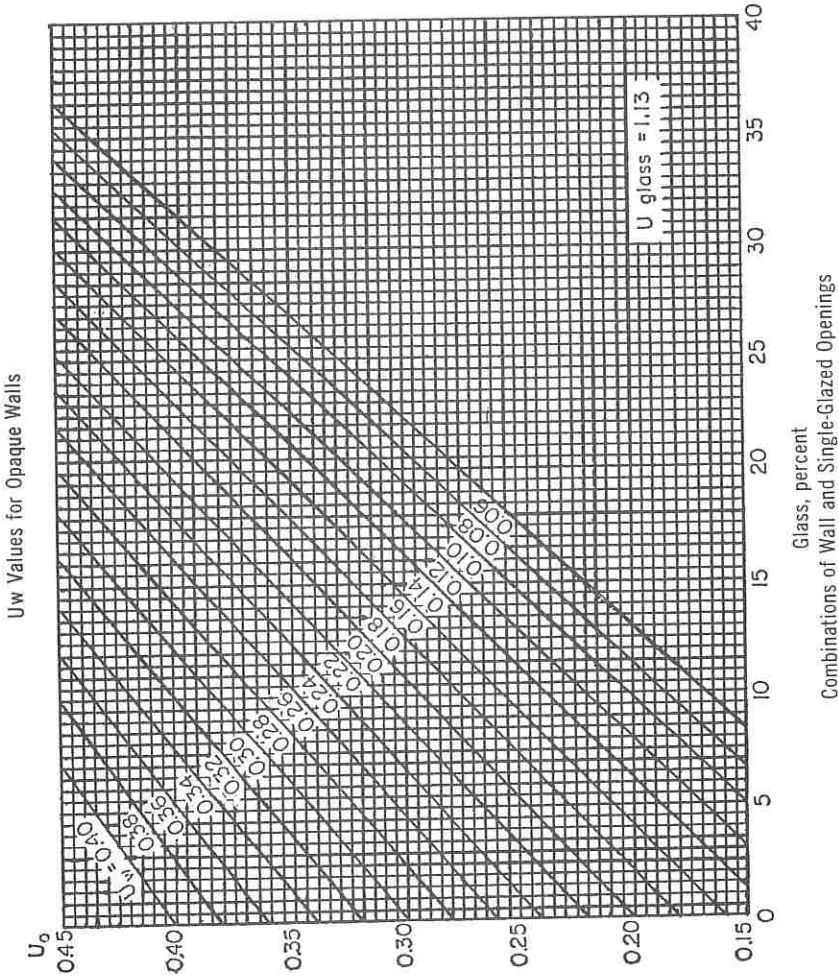
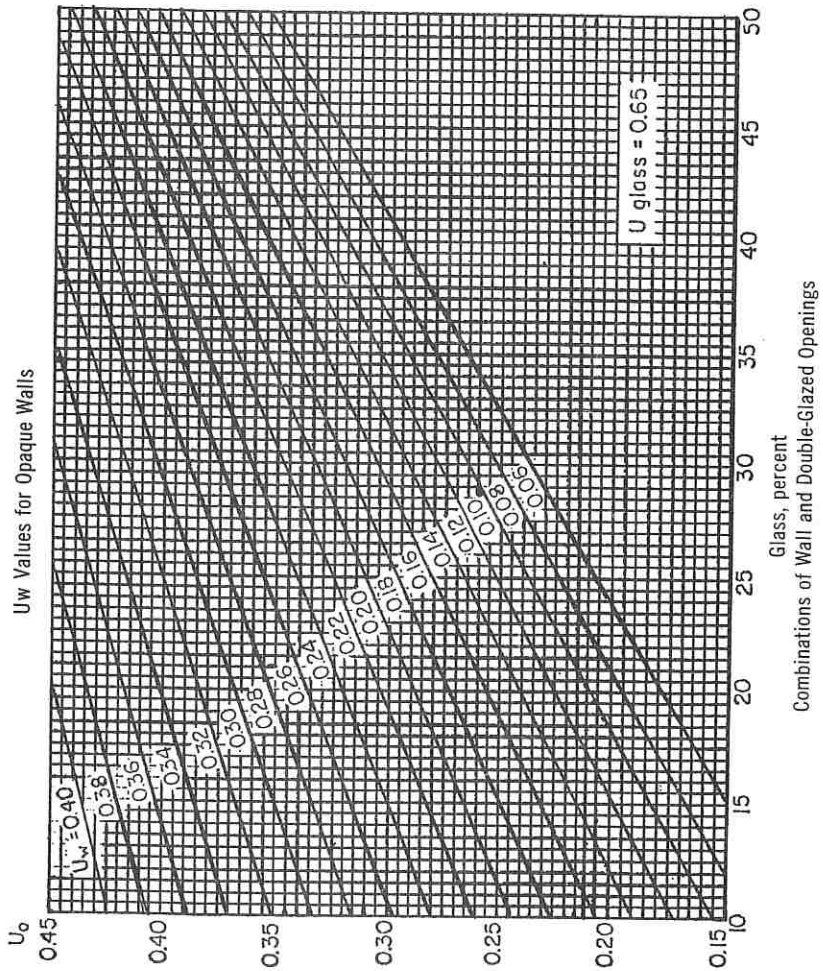




Figure 2002.2.1c  
DOUBLE GLAZED OPENINGS



**2002.2.2 Roof/ceiling:** The roof/ceiling assemblies shall have a combined thermal transmittance value ( $U_o$ ) as specified in the following Table 2002.2.2.

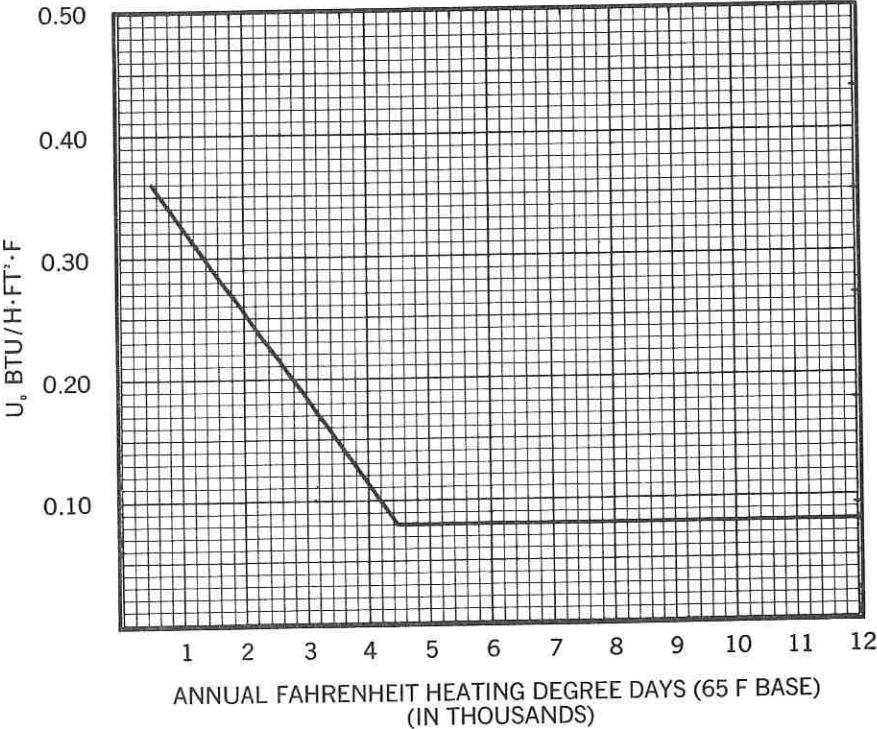
**Exception:** Roof/ceiling assemblies in which the finished interior surface is essentially the underside of the roof deck, such as a wooden cathedral ceiling, may have a " $U_o$ " value not to exceed 0.08 Btu per hour per square foot per degree F. for any Heating Degree Day area.

Table 2002.2.2  
MAXIMUM ALLOWABLE " $U_o$ " VALUES  
FOR ROOF/CEILING ASSEMBLIES

Annual heating degree days	Maximum " $U_o$ "
8000 or Less	0.05
More than 8000	0.04

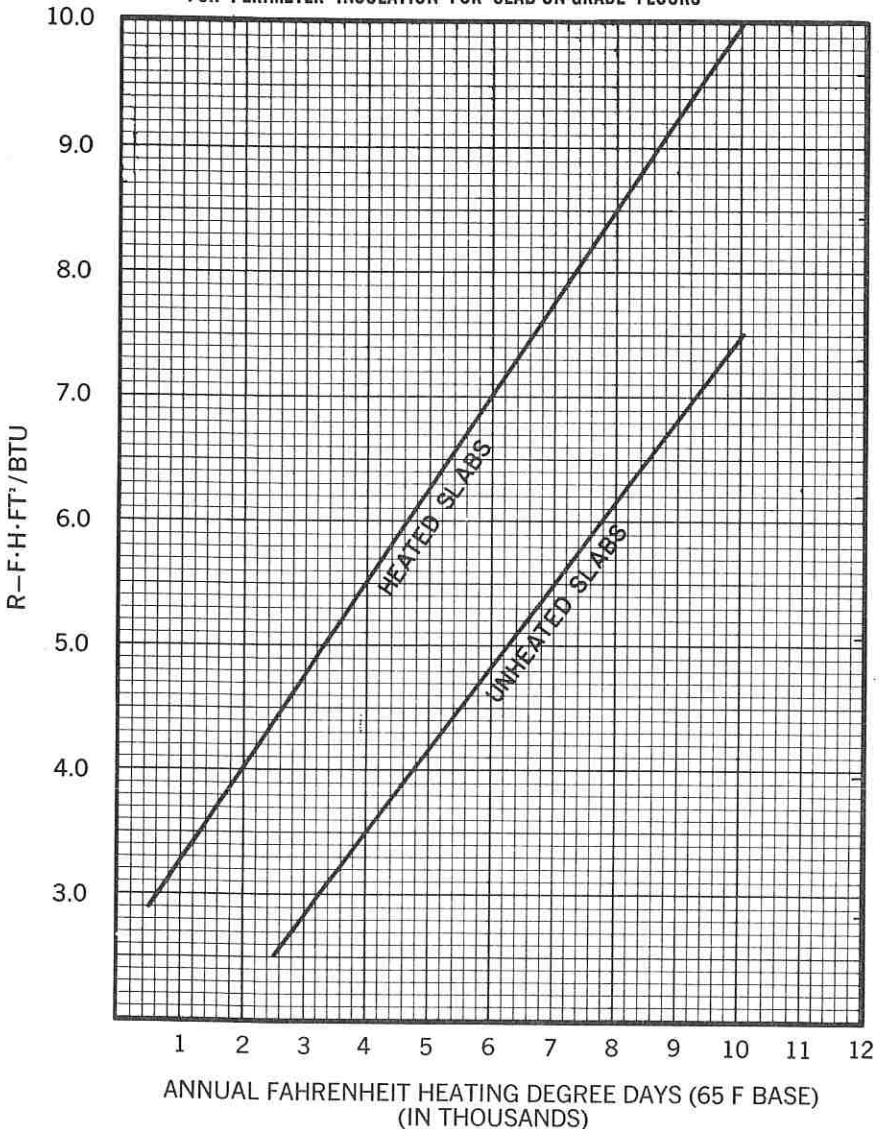
**2002.2.3 Floors over unheated spaces:** The floor of a heated or mechanical cooled space located over an unheated space shall have a combined thermal transmittance value ( $U_o$ ) as specified in the following Figure 2002.2.3.

Figure 2002.2.3  
MAXIMUM ALLOWABLE  $U_o$  VALUES  
FOR FLOORS OVER UNHEATED SPACES



**2002.2.4 Slab-on grade floors:** For slab-on grade floors, the perimeter of the floor shall be insulated with a material having a thermal resistance value (R) not less than those specified in the following Figure 2002.2.4. The insulation shall extend downward from the top of the slab for a minimum distance of twenty-four (24) inches or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of twenty-four (24) inches.

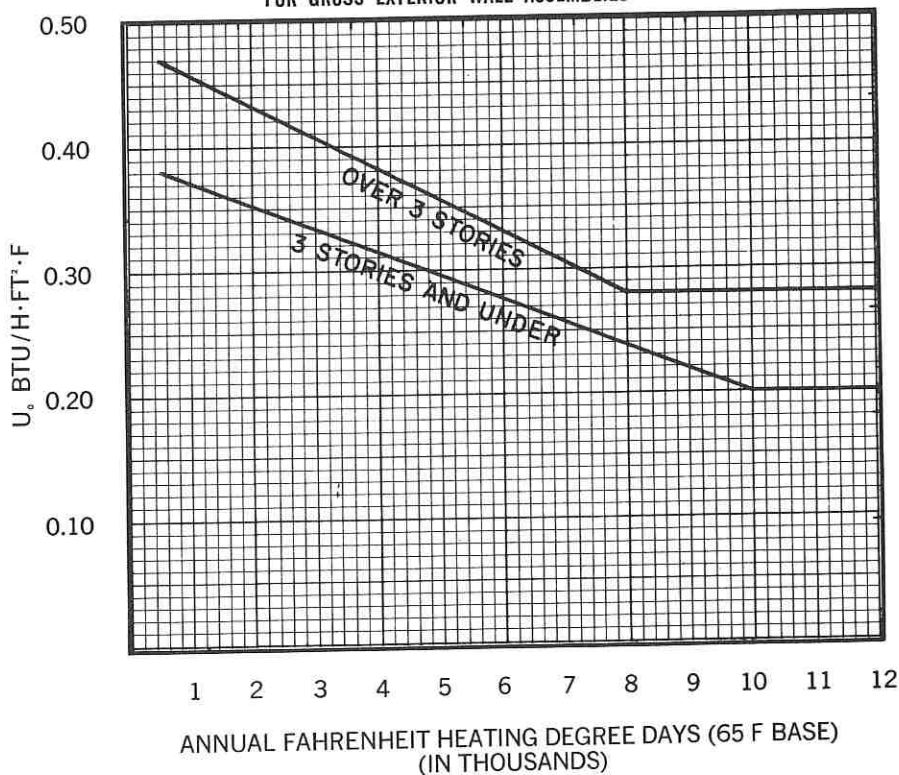
Figure 2002.2.4  
MINIMUM ALLOWABLE R VALUES  
FOR PERIMETER INSULATION FOR SLAB-ON-GRADE FLOORS



**2002.3 Other buildings:** The requirements herein shall govern all buildings and structures or portions thereof other than defined by Section 2002.2.

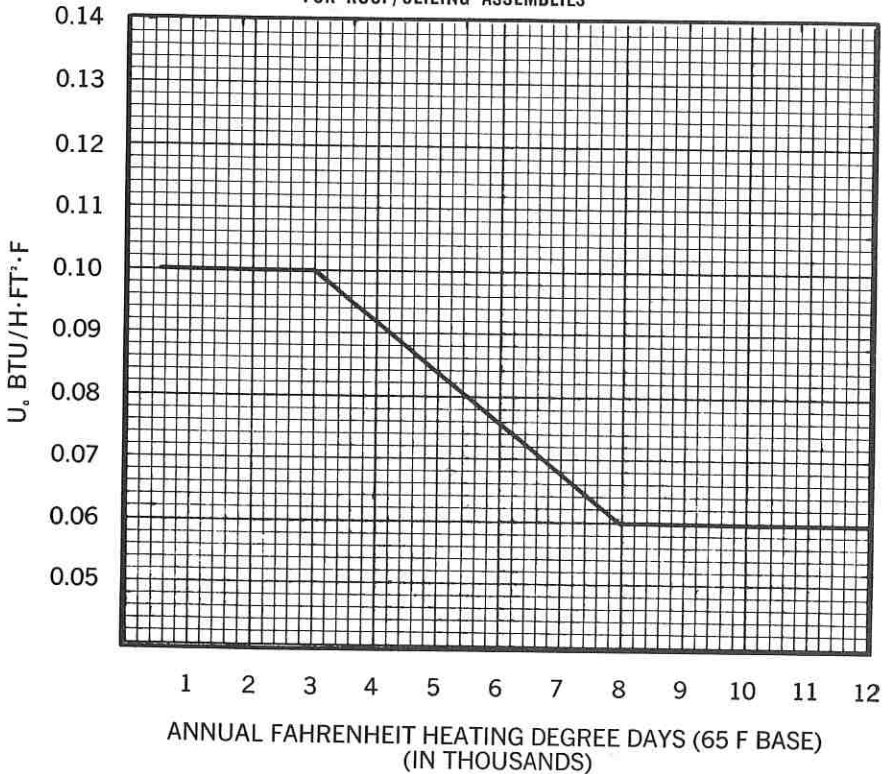
**2002.3.1 Heating criteria for walls:** All buildings and structures that are heated shall have a combined thermal transmittance value ( $U_o$ ) for the gross area of exterior walls not exceeding those specified in the following Figure 2002.3.1.

Figure 2002.3.1  
MAXIMUM ALLOWABLE  $U_o$  VALUES  
FOR GROSS EXTERIOR WALL ASSEMBLIES



**2002.3.2 Heating criteria for roof/ceiling:** All buildings and structures that are heated shall have a combined thermal transmittance value ( $U_o$ ) for roof/ceiling assemblies not exceeding those specified in the following Figure 2002.3.2.

Figure 2002.3.2  
MAXIMUM ALLOWABLE  $U_o$  VALUES  
FOR ROOF/CEILING ASSEMBLIES



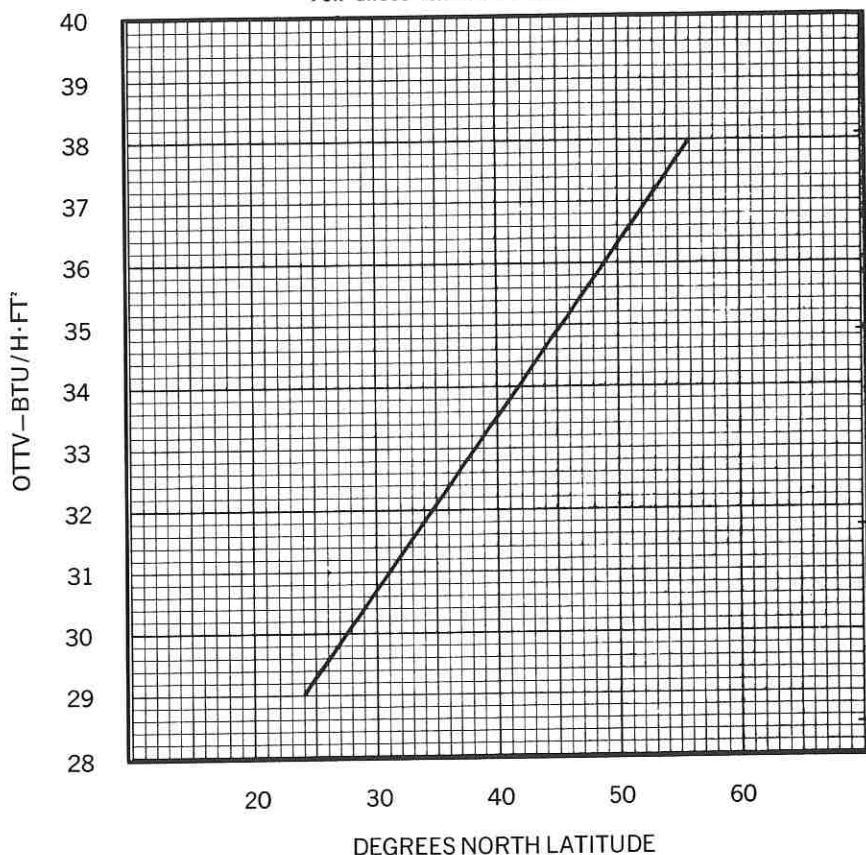
**2002.3.3 Heating criteria for floors over unheated spaces:** The floor of a heated space located over an unheated space shall have a thermal transmittance value ( $U_o$ ) not exceeding those specified in Figure 2002.2.3.

**2002.3.4 Heating criteria for slab-on grade floors:** For slab-on-grade floors, the perimeter of the floor shall be insulated with a material having a thermal resistance value ( $R$ ) not less than those specified in Figure 2002.2.4.

The insulation shall extend downward from the top of the slab for a minimum distance of twenty-four (24) inches or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of twenty-four (24) inches.

**2002.3.5 Cooling criteria for walls:** All buildings and structures, or portions thereof, that are mechanically cooled shall have an overall thermal transfer value for the gross area of exterior walls not exceeding those specified in the following Figure 2002.3.5.

Figure 2002.3.5  
MAXIMUM OVERALL THERMAL TRANSFER VALUES  
FOR GROSS EXTERIOR WALLS



**2002.3.6 Cooling criteria for roof/ceilings:** All buildings and structures, or portions thereof, that are mechanically cooled shall have a combined thermal transmittance value ( $U_o$ ) for roof/ceiling assemblies the same as specified in Figure 2002.3.2 for heating.

**2002.4 Air leakage:** The requirements of this section shall apply to all buildings and structures and apply only to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled and are not applicable to separation of interior spaces from each other.

**2002.4.1 Standard:** Compliance with the criteria for air leakage shall be determined by ASTM E283, Standard Method of Test for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors, listed in Appendix E at a pressure differential of one and five-hundred sixty-seven thousandths (1.567) lb/ft<sup>2</sup> which is equivalent to the effect of a twenty-five (25) mph wind.

**2002.4.2 Acceptance criteria:** The air infiltration rate for windows shall not exceed point five (0.5) cfm per foot of sash crack.

**2002.4.2.1 Sliding doors:** The air infiltration rate for sliding glass doors in residential buildings shall not exceed point five (0.5) cfm per foot of door area.

**2002.4.2.2 Swinging doors:** The air infiltration rate for swinging doors in residential buildings shall not exceed one point twenty-five (1.25) cfm per square foot of door area.

**2002.4.2.3 Other doors:** The air infiltration rate for swinging, revolving or sliding doors in other than residential buildings shall not exceed eleven (11) cfm per lineal foot of door crack.

**2002.4.3 Caulking and sealants:** Exterior joints around windows and door frames, between wall cavities and window or door frames, between wall and foundation, between wall and roof, between wall panels, at penetrations or utility services through walls, floors and roofs, and all other openings in the exterior envelope shall be sealed in an approved manner.

## SECTION 2003.0 ALTERNATIVE SYSTEMS

**2003.1 General:** Alternative building systems and equipment design may be approved by the building official when they can be shown to have energy consumption not greater than that of a similar building with similar forms of energy requirements, designed in accordance with the provisions of this article.

**2003.1.1** When such alternative systems utilize solar, geothermal, wind or other nondepletable energy sources for all or part of its energy sources, such nondepletable energy supplied to the building shall be excluded from the total energy chargeable to the proposed alternative design.

**2003.2 Documentation:** Proposed alternative designs, submitted as requests for exception to the standard design criteria, must be accompanied by an energy analysis prepared in accordance with the ASHRAE Standard 90 listed in Appendix B.





## GENERAL NOTES CONCERNING STANDARDS CITED IN THE BASIC BUILDING CODE

The standards issued by the accredited authoritative agencies listed herein are intended to serve as criteria for accepted safe practice for various materials, products, systems of construction, or specific uses as required or used under the provisions of this code. The text of the code referring to any standard indicates whether conformance with that standard is mandatory or permissive.

In the following appendices, an effort has been made to group the standards according to the principal subjects to which they apply. Some standards cover both accepted engineering practice and material specifications, or other combinations of subject matter, so that it is sometimes necessary for convenience to list them in more than one of the appendices.

Wherever possible, the standards have been listed under the designation of the principal authoring agency. Many of these standards are reissued by one or more agencies, in addition to the authoring agency, under their own designations. While there may be some variation in details in the various versions of the same standard issued by several agencies, these differences are generally of such minor nature that any of the versions is acceptable even though not specifically listed herein.

For example, the standard fire test procedure for building construction and materials originating in a committee of the American Society for Testing Materials and issued as *ASTM E119 Methods of Fire Tests of Building Construction and Materials*, is also published by the National Fire Protection Association and issued as *NFPA 251 Standard Methods of Fire Tests of Building Construction and Materials*, and by Underwriters' Laboratories, Incorporated, which issues it as *UL 263 Standards for Fire Tests of Building Construction and Materials*.

In addition to the standards listed, there are a number of listings of materials, devices, products and assemblies that are accepted for specified performances. Among such listings, which are generally recognized in the *Basic Building Code*, are those listed below.

1. Test reports; inspection service; lists of building materials, fire protection and extinguishing equipment and devices; and electrical equipment, issued by Underwriters' Laboratories, Inc.

2. Test investigations; reports and lists of fire protection equipment; special hazards; electrical equipment; building construction and mill fire prevention organizations, issued by Factory Mutual Laboratories.

3. *Building Materials and Structures Report on Fire-Resistance Classifications of Building Constructions* (BMS92) issued by National Bureau of Standards.

4. *Fire-Resistance Ratings of Construction Assemblies* issued by American Insurance Association.

5. *Approved Fire-Resistance Ratings of Assemblies of Construction Materials* (columns; beams, girders and trusses; walls and partitions; floor and roof assemblies) recognized in the *Basic Building Code*, issued by Building Officials and Code Administrators International, Inc.

6. *Evaluation Service Research Reports* of specific performance of trade-name products issued to the building official; and *Follow-up Inspection Service* by Building Officials and Code Administrators International, Inc.

# APPENDIX A

## REFERENCE STANDARDS AGENCIES

*The following agencies promulgate standards referenced in this code and the following appendices. The abbreviations in front of the agency are used to identify the standards that the agency promulgates.*

### AA

Aluminum Association  
818 Connecticut Avenue, N.W.  
Washington, D.C. 20006

### AAMA

Architectural Aluminum  
Manufacturers Association  
35 East Wacker Drive  
Room 3200  
Chicago, Illinois 60601

### ABPA

American Board Products Association  
205 West Touhy Avenue  
Park Ridge, Illinois 60068

### ACI

American Concrete Institute  
P.O. Box 19150  
Redford Station  
Detroit, Michigan 48219

### AISC

American Institute of Steel  
Construction, Inc.  
1221 Avenue of the Americas  
Suite 1580  
New York, New York 10020

### AISI

American Iron and Steel Institute  
1000 Sixteenth Street, N.W.  
Washington, D.C. 20036

### AITC

American Institute of Timber  
Construction  
333 W. Hampden Avenue  
Englewood, Colorado 80110

### AInSA

American Insurance Association  
85 John Street  
New York, New York 10038

### ANSI

American National Standards  
Institute, Inc.  
1430 Broadway  
New York, New York 10018

### APA

American Plywood Association  
1119 A Street  
Tacoma, Washington 98401

### ASHRAE

American Society of Heating,  
Refrigerating and Air-Conditioning  
Engineers  
United Engineering Center  
345 East 47th Street  
New York, New York 10017

### ASME

American Society of Mechanical  
Engineers  
United Engineering Center  
345 East 47th Street  
New York, New York 10017

### ASTM

American Society for Testing and  
Materials  
1916 Race Street  
Philadelphia, Pennsylvania 19103

### AWS

American Welding Society  
2501 N.W. Seventh Street  
Miami, Florida 33125

### AWPA

American Wood Preservers'  
Association  
1625 Eye Street, N.W.  
Washington, D.C. 20006

### AWPB

American Wood Preservers Bureau  
P.O. Box 6085  
Arlington, Virginia 22206

### AWPI

American Wood Preservers Institute  
1651 Old Meadow Road  
McLean, Virginia 22101

### BIA

Brick Institute of America  
1750 Old Meadow Road  
McLean, Virginia 22101

## THE BOCA BASIC BUILDING CODE/1978

### BOCA

Building Officials and Code  
Administrators International  
17926 South Halsted Street  
Homewood, Illinois 60430

### CPSC

Consumer Product Safety Commission  
Washington, D.C. 20207

### DOC

United States Department of  
Commerce  
National Bureau of Standards  
Washington, D.C. 20234

### DOD-OCDD

Department of Defense  
Office of Civil Defense  
Office of the Secretary of the Army  
Washington, D.C. 20390

### FM

Factory Mutual Engineering  
Corporation  
Standards-Laboratories Department  
1151 Boston-Providence Turnpike  
Norwood, Massachusetts 02062

### FS

Federal Specifications  
Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402

### GA

Gypsum Association  
1603 Orrington Avenue  
Suite 1210  
Evanston, Illinois 60201

### HPMA

Hardwood Plywood Manufacturers  
Association  
P.O. Box 6246  
Arlington, Virginia 22206

### HUD

United States Department of  
Housing and Urban Development  
Division of Mobile Home Standards  
451 Seventh Street, S.W.  
Washington, D.C. 20410

### IES

Illuminating Engineers Society  
345 East 47th Street  
New York, New York 10017

### ICBO

International Conference of  
Building Officials  
5360 South Workman Mill Road  
Whittier, California 90601

### MBMA

Metal Building Manufacturers  
Association  
2130 Keith Building  
Cleveland, Ohio 44115

### NCMA

National Concrete Masonry  
Association  
6845 Elm Street  
McLean, Virginia 22101

### NFPA

National Fire Protection Association  
470 Atlantic Avenue  
Boston, Massachusetts 02210

### NFoPA

National Forest Products Association  
1619 Massachusetts Avenue, N.W.  
Washington, D.C. 20036

### RCSHSB

Red Cedar Shingle and  
Handsplit Shake Bureau  
5510 White Building  
Seattle, Washington 98101

### SJI

Steel Joist Institute  
2001 Jefferson Davis Highway  
Arlington, Virginia 22202

### SMACNA

Sheet Metal and Air-Conditioning  
Contractors National Association,  
Inc.  
8224 Old Courthouse Road  
Vienna, Virginia 22180

### SPIB

Southern Pine Inspection Bureau  
P.O. Box 846  
Pensacola, Florida 32594

### SBCCI

Southern Building Code Congress  
International  
900 Montclair Road  
Birmingham, Alabama 35213

### SSSI

Steel Scaffolding & Shoring Institute  
2130 Keith Building  
Cleveland, Ohio 44115

### TCA

Tile Council of America  
4801 Montgomery Lane  
Washington, D.C. 20014

### TPI

Truss Plate Institute, Inc.  
7411 Riggs Road  
Hyattsville, Maryland 20783

**UL**

Underwriters Laboratories Inc.  
207 East Ohio Street  
Chicago, Illinois 60611

**USDA**

United States Department of  
Agriculture  
Washington, D.C. 20225

**U.S. ARMY**

Office of the Chief of Engineers  
U.S. Army  
Publications Depot  
890 South Pickett Street  
Alexandria, Virginia 22304



# APPENDIX B

## ACCEPTED ENGINEERING PRACTICE STANDARDS

*See also Appendices C, D, E, F and G for standards on specific materials or test of units or assemblies; some of which include engineering practice standards for specific applications.*

### Concrete

Concrete Formwork—Recommended Practice for .....	ACI 347-68
Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction .....	ASTM E329-72
Manufacturing Reinforced Concrete Floor and Roof Units— Recommended Practice for .....	ACI 512-67
Reinforced Concrete—Building Code Requirements for .....	ACI 318-71
1976 Accumulative Supplement .....	ACI-76
Reinforced Concrete Structures—Manual of Standard Practice for Detailing .....	ACI 315-74
Reinforced Steel Welding Code .....	AWS D12.1-75

### Electrical Illumination

Daylighting—Recommended Practices of .....	IES RP5-62
Design Criteria for Lighting Interior Living Spaces .....	IES RP11-69
Electrical Code—National .....	NFPA 70-78
IEEE Standard Dictionary of Electrical and Electronic terms .....	ANSI C42.100-72
Industrial Lighting .....	ANSI A 11.1-73
Lighting Handbook .....	IES-72
Office Lighting—Recommended Practice .....	IES RP1-73
School Lighting—Recommended Practice .....	IES RP3-70

### Energy Conservation

ASHRAE 1977 Handbook of Fundamentals .....	ASHRAE-77
ASHRAE 1976 Systems Volume .....	ASHRAE-76
Basic Energy Conservation Code .....	BOCA-78
Energy Conservation in New Building Design .....	ASHRAE 90-75

### Equipment

#### Conveyors, Elevators, Hoists and Lifts

Construction, Care and Use of Automotive Lifts —Safety Requirements for .....	ANSI B153.1-74
Conveyors and Related Equipment—Safety Standards for .....	ANSI B20.1-76
Elevators, Dumbwaiters, Escalators and Moving Walks —Safety Code for .....	ANSI A17.1-71
—1972 Supplement .....	ANSI A17.1a-72
—1973 Supplement .....	ANSI A17.1b-73
—1974 Supplement .....	ANSI A17.1c-74
—1975 Supplement .....	ANSI A17.1d,e,f-75
Elevators, Escalators and Moving Walks—Practice for the Inspection of .....	ANSI A17.2-73
Manlifts—Safety Standard for .....	ANSI A90.1-69
—1972 Supplement .....	ANSI A90.1a-72

## THE BOCA BASIC BUILDING CODE/1978

### Equipment—continued

Material Hoists, Safety Requirements for .....	ANSI A 10.5-75
Personnel Hoists, Safety Requirements for .....	ANSI A 10.4-75
<b>Heating</b>	
Boiler Code and Unfired Pressure Vessel Code .....	ASME-77
<b>Mechanical Equipment and Piping</b>	
Basic Mechanical Code .....	BOCA-78
Basic Plumbing Code .....	BOCA-78

### Fire and Sound Tested Assemblies

Approved Guide, Equipment, Materials, Services for Conservation of Property .....	FM-FMED-77
Fire Resistance Design Manual .....	GA-600-78
Fire Resistance Directory .....	UL-77
Fire Resistance Ratings .....	AInsA-64
—1968 Supplement .....	AInsA-68
—1970 Supplement .....	AInsA-70
—1972 Supplement .....	AInsA-72

### Fire Protection and Safety Practices

Life Safety Code .....	NFiPA 101-76
NOTE: NFiPA 101-1976 is acceptable for matters of design of exits not provided for by the BOCA Codes. Finish and construction requirements incorporated therein are not applicable.	
Aircraft Hangars—Standard on .....	NFiPA 409-75
Basic Fire Prevention Code .....	BOCA-78
Cellulose Nitrate Motion Picture Film —Standard for the Storage and Handling of .....	NFiPA 40-74
Dry Cleaning Plants—Standard for .....	NFiPA 32-74
Dust Explosions and Ignition, Standard for the Prevention of —in Flour and Feed Mills and Allied Grain Storage Elevators .....	NFiPA 61C-73
—in Grain Elevators, Bulk Handling Facilities .....	NFiPA 61B-73
—in Industrial Plants—Fundamental Principles for .....	NFiPA 63-75
—in Starch Factories .....	NFiPA 61A-73
Fire Damper Guide for Air Handling Systems .....	SMACNA-70
Fire Tests for Flame Resistant Textiles and Films—Standard Methods of .....	NFiPA 701-76
<b>Garages</b>	
—Parking Structures—Standard for .....	NFiPA 88A-73
—Repair Garages—Standard for .....	NFiPA 88B-73
<b>Gas Shielded Arch Welding—Recommended Safe Practice for .....</b>	
Household Fire Warning Equipment—Standard for .....	AWS A6.1-66
Incinerators and Rubbish Handling—Standard on .....	NFiPA 74-75
Incinerators and Rubbish Handling—Standard on .....	NFiPA 82-72
Liquefied Petroleum Gases—Standard for the Storage and Handling of .....	NFiPA 58-76
Liquefied Petroleum Gases at Utility Gas Plants—Standard for the Storage and Handling of .....	NFiPA 59-76
Liquids, Flammable and Combustible—Code for .....	NFiPA 30-76
Oxygen-Fuel Gas Systems for Welding and Cutting —Standard for the Installation and Operation of .....	NFiPA 51-74
Piers and Wharves—Standard for the Construction and Protection of .....	NFiPA 87-75
Pulverized Fuel Systems—Standard for the Installation and Operation of .....	NFiPA 60-73
Pyroxylin Plastics—Code for Storage of .....	NFiPA 40E-75
Safe Practices for Welding and Cutting Containers That Have Held Combustibles .....	AWS A6.0-65



## Fire Protection and Safety Practices—continued

Safety in Welding and Cutting .....	ANSI Z49.1-73
Smoke and Heat Venting—Guide for .....	NFIPA 204-68
Spray Finishing Using Flammable and Combustible Materials— Standard for .....	NFIPA 33-73
Tents, Grandstands and Air-Supported Structures Used for Places of Assembly—Standard for .....	NFIPA 102-72

## Glass

Architectural Glazing Materials—Safety Standard for .....	CPSC 16—CFR Part 1201; 42FR1428
NOTE: Pursuant to the Consumer Products Safety Act (Federal Public Law 92-573), the Consumer Product Safety Commission has established this Safety Standard for Architectural Glazing Materials (effective July 6, 1977). This standard prescribes which architectural features and field installed configurations of glazing must be provided with appropriate glazing due to human impact hazards and prescribes standards of composition and testing which define appropriate glazing for human impact hazards. The Consumer Product Safety Act preempts state and local government requirements unless identical to those of this standard. Certain safety glazing as listed below have been administratively exempted.	
Safety Glazing Material Used in Buildings—Performance Specifications and Methods of Test for .....	ANSI Z97.1-72/75
NOTE: For products incorporating glazing material which are manufactured, fabricated, or assembled between July 6, 1977, and July 5, 1978, and where such glazing was manufactured before July 6, 1977.	

## Interior Finishes

Application and Finishing of Gypsum Board—Specifications for (See Appendix M) .....	GA 216-75
Gypsum Base for Veneer Plasters—Standard Specification for .....	ASTM C588-76
Gypsum Board Products, Gypsum Lath, Gypsum Partition Tile or Block, and Precast Reinforced Gypsum Slabs—Method of Physical Testing of .....	ASTM C473-76
Gypsum Lath—Standard Specification for .....	ASTM C37-76
Gypsum Plasters—Specification for .....	ASTM C28-76
Gypsum Plasters and Gypsum Concrete—Standard Methods for Physical Testing of .....	ASTM C472-73
Gypsum Veneer Plaster—Specifications for .....	ASTM C587-73
Gypsum Veneer Plaster—Specifications for Application .....	GA 150-70
Gypsum Wallboard—Specification for .....	ASTM C36-76
Interior Lathing and Furring—Specifications for .....	ANSI A42.4-67
Interior Marble—Specifications for .....	ANSI A94.1-61
Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels—Standard Recommended Practice for Installation of ...	ASTM C636-76
Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings—Standard Specifications for .....	ASTM C635-76
Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior, Lathing and Furring— Specifications for .....	ANSI A42.3-71
Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior—Specifications for .....	ANSI A42.2-71

## Interior Finishes—continued

Steel Framing Members to Receive Screw-Attached Gypsum Wallboard Backing Board, or Water-Resistant Backing Board—Specifications for	ASTM C754-74
Tile, Ceramic, Installed with	
—Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy	ANSI A108.6-76
—Dry-Set Portland Cement Mortar	ANSI A108.5-76
—Water Resistant Organic Adhesives	ANSI A108.4-76
Tile, Electrically Conductive Ceramic, Installed with Conductive Dry Set Portland Cement Mortar	ANSI A108.7-76
Tile, Installation of Glazed Wall Tile, Ceramic Mosaic Tile, Quarry and Paver Tile with Portland Cement Mortar	ANSI A108.1-76

## Masonry

Cold Weather Masonry Construction	BIA-68
Design and Construction of Loadbearing Concrete Masonry—Specifications for	NCMA-70
Engineered Brick Masonry—Requirements for	BIA-69
NOTE: This standard (BIA-69) is only applicable to brick masonry of solid masonry units made from clay or shale.	
Masonry—Building Code Requirements for	ANSI A41.1-70
Reinforced Masonry—Building Code Requirements for	ANSI A41.2-70

## Metal

### Aluminum

Aluminum Construction Manual, Aluminum Formed Sheet Building Sheathing Design Guide	AA-ABS32-69
Aluminum Construction Manual, Specifications for Aluminum Structures	AA-SAS30-76
Aluminum Construction Manual, Aluminum Sheet Metal Work in Building Construction	AA-ASM35-71

### Steel

Architecturally Exposed Structural Steel—Specification for	AISC-S307-60
Design of Cold-Formed Steel Structural Members—Specification for	AISI-68
Design, Fabrication and Erection of Structural Steel for Buildings—Specification for	AISC-S310-69
Supplement No. 1	AISC-S319-70
Supplement No. 2	AISC-S320-71
Supplement No. 3 Revised	AISC-S321-75
Design of Cold-Formed Stainless Steel Structural Members—Specification for	AISI-74
Gas Systems for Welding and Cutting	(See Fire Protection and Safety Practice)
Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board—Specification for	ASTM C645-76
Longspan Steel Joist LJ and LH Series, and Deepspan Steel Joists DLJ and DLH Series—Standard Specifications for	SJI/AISC-74
Metal Building Systems Manual	MBMA-74
Open Web Steel Joists, J-Series and H-Series—Standard Specification for	SJI/AISC-74
Steel Drill Screw Application of Gypsum Sheet Material to Light Gage Steel Studs—Specification for	ASTM C646-76a
Structural Applications of Steel Cables for Buildings—Criteria for	AISI-73

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Structural Joints Using ASTM A325 or A490 Bolts—	
Specification for .....	AISC—S314-76
Welding Code, Structural .....	AWS D1.1-75
—Revision No. 1 .....	AWS D1.1-Rev-1-76
—Revision No. 2 .....	AWS D1.1-Rev-2-77

**Wood and Wood Products**

Adhesives for Field Gluing Plywood to Wood Framing—	
Performance Specifications for .....	APA—AFGO1-74
All-Weather Wood Foundation System—	
Basic Requirements .....	NFoPA—TR7-76
—1977 Supplement .....	NFoPA—TR7-77
APA Glued Floor System .....	APA—U405-76
Code of Suggested Practices—Timber Construction Standard .....	AITC 106-77
Construction Details—Typical Timber Construction Standard .....	AITC 104-76
Heavy Timber Construction—Standard for .....	AITC 108-69
Joists and Rafters	
Span Tables for .....	NFoPA-77
Design Values .....	NFoPA-77
National Design Specification for Wood Construction .....	NFoPA-77
—1977 Supplement (Design Values) .....	NFoPA-77
Pile Foundations Know How .....	AWPI-70
Pole Building Design .....	AWPI-72
Plywood Commercial/Industrial Construction Guide .....	APA—Y300-76
Plywood Design Specifications .....	APA—Y510-76
Plywood-Lumber Components—Design Specifications for (includes	
curved panels, beams, stressed-skin panels, sandwich panels, diaphragm	
construction and folded plates) .....	APA—V815-77
Plywood-Lumber Components—Fabrication Specifications (includes	
curved panels, beams, stressed-skin panels, sandwich panels,	
and folded plates) .....	APA—V820-77
Plywood Residential Construction Guide .....	APA—Y405-76
Protection of Structural, Glued Laminated Timber During Transit,	
Storage and Erection—Recommended Practice for .....	AITC 111-65
Structural Design Data—Wood .....	NFoPA-70
Structural Design Guide for Hardwood Plywood .....	HPMA—HP-SG-72
Structural Glued Laminated Timber—	
Inspection Manual for .....	AITC 200-73
Structural Timber Framing—Standard for the Design of .....	AITC 102-76
Timber Construction Manual .....	AITC-74
Trusses—Design Specifications for Light Metal Plate Connected Wood .....	TPI-74
Wood Handbook .....	USDA Handbook No. 72-74

**Unclassified Miscellaneous**

Basic Property Maintenance Code .....	BOCA-78
Building Materials and Equipment—	
Coordination of Dimensions of .....	ANSI A62.1-57
Demolition—Safety Requirements for .....	ANSI A10.6-69
Fallout Shelters—Suggested Building	
Code Provisions for .....	DOD—OCD—TR-36-66
Flood Proofing Regulations .....	U.S. Army-72
Floor and Wall Openings, Railings, and	
Toe Boards—Safety Requirements for .....	ANSI A12.1-73
Installing Vitrified Clay Sewer Pipe—Recommended Practice for ....	ASTM C12-74
Loads, Minimum Design in Buildings and Other Structures—	
Building Code Requirements for .....	ANSI A58.1-72
Mobile Home Construction and Safety Standards .....	HUD-75

Unclassified Miscellaneous—continued

One- and Two-Family Dwelling Code .....	BOCA, AInA, SSBC, ICBO—75
1976 Supplement .....	BOCA, AInA, SSBC, ICBO—76
Safety Requirements for Shoring Concrete	
Formwork—Recommended .....	SSSI—73
Signs and Outdoor Display Structures—	
Building Code Requirements for .....	ANSI A60.1—49
Waterproofing and Drainage of Floors—Manual on .....	NFIPA 92M—72

# APPENDIX C

## MATERIAL STANDARDS

*See also Appendix D for standards for tests of specific materials.*

### Concrete

Aggregates, Concrete—Specifications for .....	ASTM C33—77
Aggregates, Lightweight, for Structural Concrete—Specifications for .....	ASTM C330—77
Aggregates, Lightweight, for Concrete Masonry Units .....	(See Masonry)
Aggregates, Lightweight, for Insulating Concrete—Specifications for .....	ASTM C332—77
Forms for One-way Concrete Joist Construction—Types and Sizes of .....	DOC PS 16—69
Gypsum Concrete—Specifications for .....	ASTM C317—75
Manufacturing Reinforced Concrete Floor and Roof Units—Recommended Practice for .....	ACI 512—67
Masonry Units—Concrete .....	(See Masonry)
Natural Cement—Specifications for .....	ASTM C10—76
Portland Cement—Specifications for .....	ASTM C150—77
Ready Mix Concrete—Specifications for .....	ASTM C94—74a
Reinforcing .....	(See Metals)
Sheet Materials for Curing Concrete—Specifications for .....	ASTM C171—75
Vermiculite Concrete Roofs and Slabs on Grade—Specifications for .....	ANSI A122.1—65

### Interior Finishes

Adhesives, Organic, for Installation of Ceramic Tile Types I and II—Standard for .....	ANSI A136.1—72
Aggregates, Inorganic, for use in Gypsum Plaster—Specifications for .....	ASTM C35—76
Conductive Dry-Set Portland Cement Mortar, Standard Specification for (for Ceramic Tile) .....	ANSI A118.2—76
Dry-Set Portland Cement Mortar—(for Ceramic Tile) .....	ANSI A118.1—76
Epoxy, Chemical Resistant, Water Cleanable Tile-Setting and Grouting—Standard Specifications for .....	ANSI A118.3—76
Gypsum and Gypsum Products, Chemical Analysis of—Standard Methods for .....	ASTM C471—75
Gypsum Base for Veneer Plaster—Specifications for .....	ASTM C588—76
Gypsum Board Products, Gypsum Lath, Gypsum Partition Tile or Block, and Precast Reinforced Gypsum Slabs—Method of Physical Testing of .....	ASTM C473—76
Gypsum Lath—Specifications for .....	ASTM C37—76
Gypsum Plasters—Specifications for .....	ASTM C28—76
Gypsum Plasters and Gypsum Concrete, Physical Testing of—Standard Methods for .....	ASTM C472—73
Gypsum Veneer Plaster—Specifications for .....	ASTM C587—73
Gypsum Wallboard—Specifications for .....	ASTM C36—76
Latex-Portland Cement Mortar, Standard Specification for (for Ceramic Tile) .....	ANSI A118.4—76
Lime, Hydrated, Normal Finishing—Specifications for .....	ASTM C6—74
Lime, Hydrated, Special Finishing—Specifications for .....	ASTM C206—76

**Interior Finishes—continued**

- Quicklime and Hydrated Lime—Methods of  
 Physical Testing of .....ASTM C110—76a  
 Quicklime for Structural Purposes—Specifications for .....ASTM C5—74  
 Tile, Ceramic—Standard Specifications for .....TCA 137.1—76

**Masonry**

- Aggregate, Fine—Effect of Organic Impurities in,  
 on Strength of Mortar .....ASTM C87—75  
 Aggregates, Lightweight, for Concrete Masonry Units—  
 Specifications for .....ASTM C331—77  
 Aggregate for Masonry Grout—Specifications for .....ASTM C404—76  
 Aggregate for Masonry Mortar—Specifications for .....ASTM C144—76  
 Brick, Building (Solid Masonry Units Made from  
 Clay or Shale)—Specifications for .....ASTM C62—75a  
 Brick, Concrete Building—Specifications for .....ASTM C55—75  
 Brick, Face, Calcium Silicate (Sand Lime Brick)—  
 Specification for .....ASTM C73—75  
 Brick, Facing (Solid Masonry Units Made from  
 Clay or Shale)—Specifications for .....ASTM C216—77  
 Brick, Hollow (Hollow Masonry  
 Units Made from Clay or Shale) .....ASTM C652—77  
 Cement, Masonry—Specifications for .....ASTM C91—75  
 Ceramic Tile (Veneers) .....(See Interior Finishes)  
 Clay Facing Tile, Structural—Specification for .....ASTM C212—75  
 Clay Load-Bearing Wall Tile, Structural—Specifications for .....ASTM C34—75  
 Clay Non-Load Bearing Screen Tile, Structural—  
 Specification for .....ASTM C530—75  
 Clay Non-Load-Bearing Wall Tile, Structural—Specification for .....ASTM C56—76  
 Concrete Masonry Units, Hollow Load Bearing—  
 Specifications for .....ASTM C90—75  
 Concrete Masonry Units, Hollow Non-Load Bearing—  
 Specifications for .....ASTM C129—75  
 Concrete Masonry Units, Solid Load Bearing—  
 Specifications for .....ASTM C145—75  
 Glazed Units: Ceramic Glazed Structural Clay  
 Facing Tile, Facing Brick, and Solid Masonry  
 Units—Specifications for .....ASTM C126—76  
 Gypsum Partition Tile and Block—  
 Specifications for .....ASTM C52—77  
 Lime, Hydrated for Masonry Purposes—  
 Specifications for .....ASTM C207—76  
 Limes .....(See Interior Finishes)  
 Mortar and Grout for Reinforced Masonry—  
 Specification for .....ASTM C476—76  
 Mortar for Unit Masonry—Specification for .....ASTM C270—73  
 Portland Cement-Lime Mortar for Brick Masonry—  
 Standard Specification for .....BIA M1—72  
 Portland Cement—Specifications for .....(See Concrete)

**Metal**

- Alloy Steel Bolts, Quenched and Tempered, for Structural  
 Steel Joints—Standard Specifications for .....ASTM A490—76a  
 Alloy Steel Sheets and Strip, Regular Quality  
 Hot-Rolled and Cold-Rolled—Specification for .....ASTM A506—73  
 Aluminum-Alloy Bars, Rods and Wire—  
 Standard Specifications for .....ASTM B211—75  
 Aluminum-Alloy Extruded Bars, Rods, Shapes  
 and Tubes—Standard Specifications for .....ASTM B221—76a

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Aluminum-Alloy Die and Hand Forgings— Standard Specifications for .....	ASTM B247-76
Aluminum Alloy Seamless Pipe and Seamless Extruded Tubing— Standard Specifications for .....	ASTM B241-76
Aluminum Alloy Sheet and Plate— Standard Specifications for .....	ASTM B209-77
Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded—Standard Specifications for .....	ASTM B308-73
Aluminum-Alloy Drawn Seamless Tubes— Standard Specifications for .....	ASTM B210-76
Aluminum Alloy Extruded Structural Pipe and Tube— Standard Specifications for .....	ASTM B249-75
Aluminum-Alloy Round Welded Tubes— Standard Specifications for .....	ASTM B313-73
Aluminum-Alloy Rivet and Cold Heading Wire and Rods—Standard Specifications for .....	ASTM B316-75
Aluminum Alloy Die Castings—Standard Specifications for .....	ASTM B85-76
Aluminum Alloy Permanent Mold Castings— Standard Specification for .....	ASTM B108-76
Aluminum Alloy Sand Castings—Standard Specifications for .....	ASTM B26-76a
Aluminum Sliding Glass Doors—Specifications for .....	AAMA 402.9-77
Aluminum Windows—Specifications for .....	AAMA 302.9-77
Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding—Specifications for .....	AWS A5.17-76
Bolts, High Strength, for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers—Specifications for .....	ASTM A325-76c
Bolts and Studs, Quenched and Tempered Steel— Specifications for .....	ASTM A449-76c
Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High Temperature Service— Specifications for .....	ASTM A194-77
Carbon-Steel Castings Suitable for Fusion Welding for High Temperature Service— Specifications for .....	ASTM A216-75
Carbon Steel Nuts—Specifications for .....	ASTM A563-76a
Carbon Steel Plates of Structural Quality, Low and Intermediate Tensile Strength—Specifications for .....	ASTM A283-75
Carbon Steel Strip, Cold-Rolled— Specifications for .....	ASTM A109-72
Castings, Mild-to-Medium Strength Carbon Steel for General Application—Specifications for .....	ASTM A27-77
Castings, Gray Iron—Specifications for .....	ASTM A48-76
Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Squares— Specifications for .....	ASTM A500-77
Steel Castings for Structural Purposes, High Strength—Specifications for .....	ASTM A148-73
Electrodes, Low Alloy Steel Covered Arc Welding—Specifications for .....	AWS A5.5-69
Electrodes, Mild Steel Arc Welding— Specifications for .....	AWS A5.1-69
High Strength, Low Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 inches Thick—Specifications for .....	ASTM A588-77
Hot-Formed Welded and Seamless Carbon Steel Structural Tubing—Specifications for .....	ASTM A501-76

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Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing— Specifications for .....	ASTM A618-74
Hot Rolled Carbon Steel Sheets and Strip, Structural Quality—Specifications for .....	ASTM A570-75
Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process for Roofing—Specifications for .....	ASTM A361-76
Steel, Sheet, Cold Rolled, Long Terne Coated— Specification for .....	ASTM A308-76
Low Carbon Steel, External and Internal Threaded, Standard Fasteners—Specifications for .....	ASTM A307-76b
Mild Steel Electrodes for Flux-Cored Arc Welding—Specifications for .....	AWS A5.20-69
Mild Steel Electrodes for Gas Metal-Arc Welding—Specifications for .....	AWS A5.18-69
Pipes, Welded and Seamless Steel Pipe— Specifications for .....	ASTM A252-77
Pipe, Metal .....	(See Plumbing and Piping)
Reinforcement, Axle-Steel Deformed and Plain Bars for Concrete— Specifications for .....	ASTM A617-76
Reinforcement, Deformed and Plain Billet-Steel Bars for Concrete— Specifications for .....	ASTM A615-76a
Reinforcement, Deformed Steel Wire for Concrete—Specifications for .....	ASTM A496-72
Reinforcement, Rail-Steel Deformed and Plain Bars for Concrete— Specifications for .....	ASTM A616-76
Reinforcement, Steel Wire, Cold-Drawn, for Concrete—Specifications for .....	ASTM A82-76
Reinforcement, Steel Wire, Welded Fabric for Concrete—Specifications for .....	ASTM A185-73
Reinforcement, Welded Deformed Steel Wire Fabric for Concrete—Specifications for .....	ASTM A497-72
Seven-Wire Stress-Relieved Strand, Uncoated, for Prestressed Concrete—Specifications for .....	ASTM A416-74
Steel Drill Screw Application of Gypsum Sheet Material to Light Gauge Steel Stud .....	ASTM C646-76a
Sheet Piling Steel—Specifications for .....	ASTM A328-75a
Steel, Carbon and High-Strength, Low-Alloy Hot-Rolled Sheet, Hot-Rolled Strip and Cold-Rolled Sheet, General Requirements— Standards for .....	ASTM A568-74
Steel, Cold-Rolled Sheet, Carbon Structural— Specifications for .....	ASTM A611-72
Steel Forgings, Carbon and Alloy for General Industrial Use—Specifications for .....	ASTM A668-77
Steel, Hot-Rolled and Cold-Rolled Sheet and Strip, High Strength, Low-Alloy Columbium and/or Vanadium—Specifications for .....	ASTM A607-75
Steel, Hot-Rolled and Cold-Rolled Sheet and Strip, High-Strength, Low-Alloy with Improved Corrosion Resistance—Specifications for .....	ASTM A606-75
Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, General Requirements—Specifications for .....	ASTM A525-73
Stainless and Heat-Resisting Chromium Steel Plate, Sheet and Strip—Standard for .....	ASTM A176-77
Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip—Standard for .....	ASTM A167-77
Steel Structural Rivets—Specifications for .....	ASTM A502-76
Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board—Specification for .....	ASTM C645-77



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Structural Steel—Specifications for .....	ASTM A36—75
Structural Steel, High Strength—	
Specifications for .....	ASTM A440—75
Structural Steel, High Strength Low Alloy—	
Specifications for .....	ASTM A242—75
Structural Steel, High Strength Low Alloy	
Columbium Vanadium—Specifications for .....	ASTM A572—77
Structural Steel, High Strength Low Alloy	
Manganese Vanadium—Specifications for .....	ASTM A441—75
Structural Steel, High Yield Strength.	
Quenched and Tempered Alloy Steel Plate, Suitable	
for Welding—Specifications for .....	ASTM A514—77
Structural Steel with 42,000 psi Minimum Yield Point	
(½ in. Maximum Thickness)—Specification for .....	ASTM A529—75
Uncoated Stress-Relieved Wire for Prestressed Concrete—	
Specifications for .....	ASTM A421—76

**Plumbing and Piping**

Asbestos-Cement Non-Pressure Sewer Pipe—	
Specifications for .....	ASTM C428—77
Asbestos-Cement Pressure Pipe—	
Specifications for .....	ASTM C296—76
Brass Pipe, Seamless Red Brass—	
Specification for .....	ASTM B43—76
Cast Iron and Ductile Iron Pressure Pipe—	
Specifications for .....	ASTM A377—77
Cast Iron Soil Pipe and Fittings—	
Specifications for .....	ASTM A74—75
Clay Pipe	
—Compression Joints for Vitrified Clay	
Bell and Spigot Pipe .....	ASTM C425—75
—Drain Tile—Specifications for .....	ASTM C4—75
—Extra Strength and Standard Strength	
Clay Pipe and Perforated Clay Pipe—	
Specifications for .....	ASTM C700—75
Concrete Pipe	
—Culvert Storm Drain and Sewer, Reinforced	
Specifications for .....	ASTM C76—76
—Sewer—Specifications for .....	ASTM C14—75
Copper Drainage Tube (DWV)—Specification for .....	ASTM B306—76
Copper Pipe, Seamless, Standard Sizes—	
Specifications for .....	ASTM B42—76
Steel Pipe	
—Black and Hot Dipped Zinc Coated (Galvanized)	
Welded and Seamless, for Ordinary Uses—	
Specifications for .....	ASTM A120—77
—Steel or Iron, Spiral-Welded—	
Specifications for .....	ASTM A211—75
—Welded and Seamless—Specifications for .....	ASTM A53—77
Tile, Clay Drain .....	(See Clay Pipe)
Tube and Tubing	
—Brass, Seamless—Specifications for .....	ASTM B135—74
—Copper, Seamless—Specifications for .....	ASTM B75—77
—Copper, Seamless, Water—Specifications for .....	ASTM B88—76
—Copper Brazed Steel Tubing—	
Specifications for .....	ASTM A254—76
Welded and Seamless Wrought Steel Pipe .....	ANSI B36.10—75
Valves, Flanges and Pipe Fittings, Gray	
Iron Castings—Specifications for .....	ASTM A126—73

## Roofing and Siding

Asphalt for Dampproofing and Waterproofing—	
Specifications for .....	ASTM D449-73
Asphalt for Use in Constructing Built-Up	
Roof Coverings—Specifications for .....	ASTM D312-77
Asphalt Roll Roofing Surfaced with	
Mineral Granules—Specifications for .....	ASTM D249-73
Asphalt Roll Roofing Surfaced with Powdered	
Talc or Mica—Specifications for .....	ASTM D224-75
Asphalt Shingles Surfaced with Mineral	
Granules—Specifications for .....	ASTM D225-70
Asphalt Siding Surfaced with Mineral	
Granules—Specifications for .....	ASTM D699-70
Fiberboard Nail-Base Sheathing—	
Standard Specification for .....	ASTM D2277-75
Fiber Insulation Board, Structural and Decorative	
—Recommended Product and Application Specification	
½ Inch Fiberboard Nail-Base Sheathing .....	ABPA-IB Spec. No. 2-75
—Recommended Product and Application Specification	
Structural Insulating Roof Deck .....	ABPA-IB Spec. No. 1-75
—Method of Testing (Made from Cellulosic fiber) .....	ASTM C209-72
—Specifications for (Made from Cellulosic fiber) .....	ASTM C208-72
Formboard, Structural Insulating (Made from	
Cellulosic Fibers)—Specifications for .....	ASTM C532-74
Grading Rules for CertiGrade Red Cedar Shingles .....	RCSHSB-75
Gypsum Sheathing Board—Specifications for .....	ASTM C79-76

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American Softwood Lumber Standard .....	DOC PS20-70
Fire Retardant Pressure Treatment, Plywood .....	AWPA C27-74
Fire Retardant Pressure Treatment,	
Structural Lumber .....	AWPA C20-74
Glued Laminated Structural Lumber Standards	
—Appearance Grades .....	AITC 110-76
—Dimensions of .....	AITC 113-75
—“E” Rated and Visually Graded Lumber of Douglas Fir,	
Southern Pine, Hem-Fir, Lodgepole pine .....	AITC 120-74
—Electric Utility Framing and Crossarms .....	AITC 114-74
—Structural Glued Laminated Members and	
Laminations Before Gluing of Southern	
Pine, Pacific Coast Douglas Fir and	
Western Hemlock by Pressure Process .....	AWPA C28-76
—Structural Glued Laminated Southern Pine .....	SPIB-74
—Structural Glued Laminated Timber .....	DOC PS 56-73
—Structural Glued Laminated Timber of	
Douglas Fir, Western Larch, Southern	
Pine and California Redwood .....	AITC 117-76
—Supplement No. 2—Hem Fir .....	AITC-73
—Supplement No. 3—Douglas Fir and Western Larch Outer	
Laminations and Western Woods Core Laminations .....	AITC-74
—Supplement No. 5—Douglas Fir, Western Larch, and Western Woods,	
for Small Beams of 20 Inches Depth or Less .....	AITC-76
Hardboard—Commercial Standard for .....	DOC PS 58-73
Hardboard Siding, Voluntary Product Standard for .....	DOC PS 60-73
Hardwood Glued Laminated Timber—Standard Specifications for .....	AITC 119-76
Laminated Hardwood Block Flooring—Standard for .....	ANSI O10.2-75
Methods for Establishing Structural Grades and	
Related Allowable Properties for Visually Graded	
Lumber .....	ASTM D245-74

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Methods of Test for Durability of Fire Retardant Treatment of Wood .....	ASTM D-2898-77
Particleboard—Commercial Standard for .....	DOC CS 236-66
Piles, Round Timber— Establishing Design Stresses for .....	ASTM D2899-74
Piles, Timber, Round— Specifications for .....	ASTM D25-73
Plywood —Construction and Industrial— Product Standard for .....	DOC PS I-74
—Hardwood and Decorative— Product Standard for .....	DOC PS51-71
—Preservative Treatment for Pressure Process .....	AWPA C9-76
Preservative Treatment —of Lumber, Timber, Bridge Ties, and Mine Ties (All Species)—Standards for .....	AWPA C2-76
—of Piles by Pressure Process—Standards for .....	AWPA C3-76
—of Poles by Pressure Process—Standards for .....	AWPA C4-75
—by Pressure Process—All Timber Products— Standards for .....	AWPA C1-76
Preservatives for Wood —Creosote—Standards for .....	AWPA P 1-65
—Creosote and Creosote Solutions .....	AWPA P 2-76
—Oil-Borne Preservatives—Standards for .....	AWPA P 8-74
—Oil-Borne Solvents—Standards for .....	AWPA P 9-76
—Water-Borne Preservatives—Standards for .....	AWPA P 5-76
Quality Control Standards for Pressure- Treated Lumber and Plywood —With Creosote or Creosote Coal Tar Solution (For Above Ground Use) .....	AWPB-LP-5-75
—With Creosote or Creosote Coal Tar Solution (For Ground Contact) .....	AWPB-LP-55-75
—With Heavy Petroleum Solvent-Penta Solution (For Above Ground Use) .....	AWPB-LP-7-75
—With Heavy Petroleum Solvent-Penta Solution (For Ground Contact) .....	AWPB-LP-77-76
—With Light Petroleum Solvent-Penta Solution (For Above Ground Use) .....	AWPB-LP-3-75
—With Light Petroleum Solvent-Penta Solution (For Ground Contact) .....	AWPB-LP-33-75
—With Volatile Petroleum Solvent (LPG)-Penta Solution (For Above Ground Use) .....	AWPB-LP-4-75
—With Volatile Petroleum Solvent (LPG)-Penta Solution (For Ground Contact) .....	AWPB-LP-44-75
—With Water-Borne Preservatives (For Above Ground Use) .....	AWPB-LP-2-75
—With Water-Borne Preservatives (For Ground Contact) .....	AWPB-LP-22-75
Shingles .....	(See Roofing and Siding)
Structural Timber Framing—Treating Standard for .....	AITC 109-77
Tongue-and-Groove Heavy Timber Roof Decking— Standard for .....	AITC 112-74

**Unclassified Miscellaneous**

Felt—Methods of Testing .....	ASTM D461-72
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Unclassified Miscellaneous—continued

Flammability of Flexible Plastic—	
Method of Test for .....	ASTM D568-77
Flammability of Self-supporting Plastics—	
Method of Test for .....	ASTM D635-77
Formboard, Gypsum—Specification for .....	ASTM C318-73
Insulated Metal Roof Deck Standard .....	FM-FMRC 4450-71
Laboratory Measurement of Airborne Sound Transmission	
Loss of Building Partitions, Standard Recommended	
Practice for .....	ASTM E90-75
Laboratory Measurement of Impact Sound Transmission	
Through Floor-Ceiling Assemblies Using the Tapping	
Machine, Tentative Method of .....	ASTM E492-73T
Nails, Brads, Staples and Spikes:	
Wire, Cut and Wrought—Federal Specifications	
for, with Amendment 3-1974 .....	FSFF-N-105B-71
Nails for the Application of	
Gypsum Wallboard—Standard	
Specifications for .....	ASTM C514-72
Perlite Loose Fill Insulation—	
Standard Specifications for .....	ASTM C549-73
Plastics—Definitions of Terms Relating to .....	ASTM D883-76
Plastics, Deformation of, Under Load—	
Method of Test for .....	ASTM D621-76
Plastics, Density of Smoke from Burning or Decomposition	
—Method of Test for .....	ASTM D2843-77
Plastics, Ignition Properties of,	
—Method of Test for .....	ASTM D1929-77
Thickness of Solid Electrical Insulation—	
Method of Test for .....	ASTM D374-74
Vermiculite Loose Fill Insulation—	
Standard Specifications for .....	ASTM C516-75

## APPENDIX D

### STRUCTURAL UNIT TEST STANDARDS

*See also Appendices B and C for engineering practice standards and material standards which contain unit test methods.*

#### Concrete

Coarse Aggregates, Resistance to Abrasion of Small Size, by use of the Los Angeles Abrasion Machine—Test for .....	ASTM C131—76
Fine and Coarse Aggregates, Sieve or Screen Analysis of— Test for .....	ASTM C136—76
Concrete, Obtaining and Testing Drilled Cores and Sawed Beams of .....	ASTM C42—74
Concrete Test Specimens in the Laboratory—Making and Curing ..	ASTM C192—76
Concrete, Molded Cylinders—Test for Compressive Strength of .....	ASTM C39—72
Lightweight Insulating Concrete, Compressive Strength—Test for .....	ASTM C495—77
Concrete Masonry Units—Sampling and Testing .....	ASTM C140—75
Concrete Masonry Units, Hollow Load Bearing— Specifications for .....	ASTM C90—75
Concrete Masonry Units, Solid Load Bearing— Specifications for .....	ASTM C145—75
Concrete, Hardened Portland Cement—Test for Cement Content of .....	ASTM C85—73
Concrete, Ready Mixed—Specifications for .....	ASTM C94—74a
Sands for Concrete—Test for Organic Impurities in .....	ASTM C40—75

#### Interior Finishes

Gypsum and Gypsum Products, Chemical Analysis of— Standard Methods for .....	ASTM C471—75
Gypsum Board Products, Gypsum Lath, Gypsum Partition Tile or Block, and Precast Reinforced Gypsum Slabs—Method of Physical Testing of .....	ASTM C473—76
Gypsum Concrete—Specifications for .....	ASTM C317—75
Gypsum Formboard—Specifications for .....	ASTM C318—73
Gypsum Lath—Specifications for .....	ASTM C37—76
Gypsum Plasters—Specifications for .....	ASTM C28—76
Gypsum Plasters and Gypsum Concrete, Physical Testing of— Standard Methods for .....	ASTM C472—73
Gypsum Sheathing Board—Specifications for .....	ASTM C79—76
Gypsum Wallboard—Specifications for .....	ASTM C36—76
Insulating Board (Made from Cellulosic Fiber), Structural and Decorative —Methods of Testing .....	ASTM C209—72
—Specifications for .....	ASTM C208—72
Lime .....	(See Masonry)

#### Masonry

Aggregate for Masonry Mortar—Specifications for .....	ASTM C144—76
Brick, Concrete Building—Specifications for .....	ASTM C55—76
Brick and Structural Clay Tile—Sampling and Testing .....	ASTM C67—73
Cement, Masonry—Specifications for .....	ASTM C91—75

## Masonry—continued

Ceramic Tile (Veneers) .....	(See Interior Finishes)
Chemical Analysis of Limestone, Quicklime and Hydrated Lime .....	ASTM C25-72
Concrete Masonry Units .....	(See Concrete)
Diagonal Tension (Shear) in Masonry Assemblages—Method of Test for .....	ASTM E519-74
Flexural Bond Strength of Masonry—Methods of Test for .....	ASTM E518-76
Glazed Units—Ceramic Glazed Structural Clay Facing Tile, Facing Bricks, and Solid Masonry Units—Specifications for .....	ASTM C126-76
Lime and Limestone Products—Methods of Sampling, Inspection, Packing and Marking of .....	ASTM C50-74
Lime, Hydrated and Quick—Methods of Physical Testing of .....	ASTM C110-76a
Lime, Hydraulic Hydrated for Structural Purposes—Specifications for .....	ASTM C141-72
Mortars, Hydraulic Cement—Method of Test for Compressive Strength of (Using 2 in. Cube Specimens) .....	ASTM C109-77
Mortars, Hydraulic Cement—Method of Test for Tensile Strength of .....	ASTM C190-77
Stone, Natural Building—Methods of Test for Absorption and Bulk Specific Gravity of .....	ASTM C97-77
Stone, Natural Building—Method of Test for Compressive Strength of .....	ASTM C170-76
Stone, Natural Building—Methods of Test for Modulus of Ruptures of .....	ASTM C99-76
Water Permeance of Masonry—Method of Test for .....	ASTM E514-74

## Metals

Cast Iron—Method of Testing Compression of .....	ASTM A256-76
Metallic Materials—Methods of Tension Testing of .....	ASTM E8-77a

## Unclassified Miscellaneous

Cement, Hydraulic—Methods of Sampling .....	ASTM C183-76
Cement, Natural—Specifications for .....	ASTM C10-76
Cement, Portland—Specifications for .....	ASTM C150-77
Clay Pipe, Testing .....	ASTM C301-76
Plastics Under Load—Method of Test for Deformation of .....	ASTM D621-75
Tile, Clay Drain—Specification for .....	ASTM C4-75

## Wood and Wood Products

Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials .....	ASTM D1037-72a
Timber, Small Clear Specimens—Method of Testing .....	ASTM D143-72
Timbers in Structural Sizes—Methods of Static Tests of .....	ASTM D198-76
Veneer, Plywood and Other Glued Veneer Construction—Methods of Testing .....	ASTM D805-72

## APPENDIX E

### STRUCTURAL ASSEMBLY TEST STANDARDS

*See also Appendix D for standards for tests of unit materials.*

Mechanical Fasteners in Wood, Testing of .....	ASTM D1761-77
Heavy Truss Assemblies, Testing .....	ASTM E73-74
Panels for Building Construction—Methods of Conducting Strength Test of .....	ASTM E72-77
Rate of Leakage Through Exterior Windows, Curtain Walls and Doors, Standard Method of Test for .....	ASTM E283-73





# APPENDIX F

## DURABILITY TEST STANDARDS

*See also Appendices C, D and E for tests of individual materials or unit assemblies.*

### Concrete and Concrete Aggregate

Concrete, Aggregate—Method of Tests for Voids in .....	ASTM C30-70
Concrete, Air Content of Freshly Mixed, by the Pressure Method—Method of Test for .....	ASTM C231-75
Unit Weight, Yield and Air Content (Gravimetric) of Concrete—Test for .....	ASTM C138-75
Organic Impurities in Sand for Concrete—Method of Test for .....	ASTM C40-75

### Masonry and Masonry Products

Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units— Specifications for .....	ASTM C126-76
Freezing and Thawing Tests (see specifications for material) —Brick and Structural Clay Tile—Sampling and Testing .....	ASTM C67-73
—Clay Drain Tile—Specifications for .....	ASTM C4-75

### Plastics

Water Absorption of Plastics—Methods of Test for .....	ASTM D570-77
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### Roofing and Siding

Asphalt Roll Roofing, Cap Sheets, and Shingles— Methods of Testing .....	ASTM D228-69
Bituminous Materials, Accelerated Test of Weathering— Recommended Practice for .....	ASTM D529-73
Felted and Woven Fabrics Saturated with Bituminous Substance for Use in Waterproofing and Roofing— Methods of Sampling and Testing .....	ASTM D146-72

### Unclassified Miscellaneous

Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials—Specifications for .....	ASTM D1037-72a
Gypsum and Gypsum Products, Chemical Analysis of— Standard Methods for .....	ASTM C471-75
Gypsum Board Products, Gypsum Lath, Gypsum Partition Tile or Block, and Precast Reinforced Gypsum Slabs—Method of Physical Testing of .....	ASTM C473-76
Gypsum Plasters and Gypsum Concrete, Physical Testing of— Standard Methods for .....	ASTM C472-73



## APPENDIX G

### FIRE TEST AND FLAME SPREAD TEST STANDARDS

#### Combustible or Noncombustible Properties

- Noncombustibility of Elementary Materials—  
Method of Test for Determining .....ASTM E136-73

#### Fireresistance Properties

- Building Construction and Materials—  
Methods of Fire Test of .....ASTM E119-76  
Ceiling Construction .....(See Building Construction)  
Door Assemblies—Methods of  
Fire Tests of .....ASTM E152-76  
Fire Dampers .....UL 555-73  
Fire Tests for Flame-Resistant  
Textiles and Films—Standard  
Methods of .....NFiPA 701-76  
Roof Coverings—Methods of  
Fire Test of .....ASTM E108-75  
Tents, Grandstands and Air-Supported  
Structures Used for Places  
of Assembly—Standard for .....NFiPA 102-72

#### Flame Spread Properties

- Sound Controlling Blocks and Boards (Acoustical Tiles and Panels,  
Prefabricated) with amendment No. 4-1976 .....FS SS-118a-67  
Surface Burning Characteristics of Building Materials—  
Method of Test for .....ASTM E84-77

#### Flash Point

- Flash Point by Pensky-Masters Closed Tester—Method  
of Test for .....ASTM D93-73  
Flash Point by Tag Closed Tester—Method of Test for .....ASTM D56-75  
Flash and Fire Points by Cleveland Open Cup—  
Method of Test for .....ASTM D92-72

#### Unclassified Miscellaneous

- Surface Flammability of Carpets and Rugs—  
Standard for the .....DOC FF-1-70



# APPENDIX H

## STANDARD TIME-TEMPERATURE FIRE TEST CONTROLS

Time h:min	Temperature, deg F	Curve area above 68 F base		Temperature, deg C	Curve area above 20 C base	
		Deg. F. x min.	Deg. F. x hr.		Deg. C. x min.	Deg. C. x hr.
0:00	68	00	00	20	00	0
0:05	1,000	2,330	39	538	1,290	22
0:10	1,300	7,740	129	704	4,300	72
0:15	1,399	14,150	236	760	7,860	131
0:20	1,462	20,970	350	795	11,650	194
0:25	1,510	28,050	468	821	15,590	260
0:30	1,550	35,360	589	843	19,650	328
0:35	1,584	42,860	714	862	23,810	397
0:40	1,613	50,510	842	878	28,060	468
0:45	1,638	58,300	971	892	32,390	540
0:50	1,661	66,200	1,103	905	36,780	613
0:55	1,681	74,220	1,237	916	41,230	687
1:00	1,700	82,330	1,372	927	45,740	762
1:05	1,718	90,540	1,509	937	50,300	838
1:10	1,735	98,830	1,647	946	54,910	915
1:15	1,750	107,200	1,787	955	59,560	993
1:20	1,765	115,650	1,928	963	64,250	1,071
1:25	1,779	124,180	2,070	971	68,990	1,150
1:30	1,792	132,760	2,213	978	73,760	1,229
1:35	1,804	141,420	2,357	985	78,560	1,309
1:40	1,815	150,120	2,502	991	83,400	1,390
1:45	1,826	158,890	2,648	996	88,280	1,471
1:50	1,835	167,700	2,795	1,001	93,170	1,553
1:55	1,843	176,550	2,942	1,006	98,080	1,635
2:00	1,850	185,440	3,091	1,010	103,020	1,717
2:10	1,862	203,330	3,389	1,017	112,960	1,882
2:20	1,875	221,330	3,689	1,024	122,960	2,049
2:30	1,888	239,470	3,991	1,031	133,040	2,217
2:40	1,900	257,720	4,295	1,038	143,180	2,386
2:50	1,912	276,110	4,602	1,045	153,390	2,556
3:00	1,925	294,610	4,910	1,052	163,670	2,728
3:10	1,938	313,250	5,221	1,059	174,030	2,900
3:20	1,950	332,000	5,533	1,066	184,450	3,074
3:30	1,962	350,890	5,848	1,072	194,940	3,249
3:40	1,975	369,890	6,165	1,079	205,500	3,425
3:50	1,988	389,030	6,484	1,086	216,130	3,602
4:00	2,000	408,280	6,805	1,093	226,820	3,780



# APPENDIX I

## FIRE PROTECTION STANDARDS

### Alarm and Detecting Systems

Alarms Systems, Public Fire Service Communications .....	NFiPA 73-75
Automatic Fire Detectors—Standard for .....	NFiPA 72E-74
Signaling Systems—Standard for the Installation, Maintenance and Use of .....	
—Auxiliary Protective—for Fire Alarm Service .....	NFiPA 72B-75
—Central Station Protective—for Guard, Fire Alarm and Supervisory Service .....	NFiPA 71-77
—Household Fire Warning Equipment .....	NFiPA 74-75
—Local Protective—for Watchman, Fire Alarm and Supervisory Service .....	NFiPA 72A-75
—Proprietary Protective—for Watchman, Fire Alarm and Supervisory Service .....	NFiPA 72D-75
—Remote Station Protective .....	NFiPA 72C-75
Smoke Detectors, Single and Multiple Stations .....	UL 217-77

### Prevention of Spread of Fire

Air Conditioning and Ventilating Systems .....	
—Other than Residence Type .....	NFiPA 90A-76
—Residence Type .....	NFiPA 90B-76
Aircraft Hangars—Standard on .....	NFiPA 409-75
Doors, Tin-Clad Fire .....	UL 10A-73
Dust Explosion Prevention .....	(See Appendix B)
Fire Doors and Windows—Standard for .....	NFiPA 80-77
Hardware, Sliding, for Standard Horizontally Mounted Tin-Clad Fire Doors .....	UL 14B-73
Hardware, Swinging, for Standard Tin-Clad Fire Doors .....	UL 14C-73

### Protection Systems

Carbon Dioxide Extinguishing Systems—Standard on .....	NFiPA 12-77
Dry Chemical Extinguishing System —Standard for .....	NFiPA 17-75
Extinguishers, Portable Fire— Standard for the Installation and Maintenance of .....	NFiPA 10-75
Fire Suppression System for Life Safety, Standard for the Design and Installation of .....	BOCA 100-78
Foam Extinguishing Systems, Standard for .....	NFiPA 11-77
Foam-Water Sprinkler Systems and Foam-Water Spray Systems— Standard for the Installation of .....	NFiPA 16-74
Foam Systems—Standard for High Expansion .....	NFiPA 11A-76
Halogenated Fire Extinguishing Agent Systems—Standard for .....	
—Halon 1211 .....	NFiPA 12B-77
—Halon 1301 .....	NFiPA 12A-77

Protection Systems—continued

Hose Systems .....	(See Standpipe and Hose Systems)
Outside Protection (Yard Piping)—Standard for .....	NFiPA 24-77
Private Fire Brigades—Recommendations for Organization, Training and Equipment of .....	NFiPA 27-75
Pumps, Centrifugal Fire—Standard for the Installation of .....	NFiPA 20-76
Sprinkler Systems—Standard for the Installation of .....	NFiPA 13-76
Sprinkler Systems—Recommended Practice for the Care and Maintenance of .....	NFiPA 13A-76
Standpipe and Hose Systems—Standard for the Installation of .....	NFiPA 14-76
Valves, Controlling Water Supplies for Fire Protection—Standard for the Supervision of .....	NFiPA 26-76
Water Spray Fixed Systems for Fire Protection—Standard for .....	NFiPA 15-77
Water Tanks for Private Fire Protection—Standard for .....	NFiPA 22-76
Wetting Agents—Standard for .....	NFiPA 18-72



# APPENDIX J

## UNIT DEAD LOADS FOR DESIGN PURPOSES

The intent of this appendix is to assist the designer and building official in establishing the minimum weights for materials commonly used in building construction. Some material assemblies have a range in weight. A typical figure is indicated, but when there is reason to suspect a considerable deviation, the actual weight should be determined.

### Note on use of Appendix J tables

When making calculations based on the tables in Appendix J, the weights of masonry include mortar but not plaster. For plaster, add 5 pounds per square foot (psf) for each face plastered. Values given represent averages. In some cases there is a considerable range of weight for the same construction.

**Table J-1**  
**UNIT DESIGN DEAD LOADS FOR CONCRETE SLABS**

Concrete slabs	Pounds per square foot
Concrete, reinforced-stone, per inch of thickness .....	12½
Concrete, reinforced-lightweight sand, per inch of thickness .....	9½
Concrete, reinforced, lightweight, per inch of thickness .....	9
Concrete, plain stone, per inch of thickness .....	12
Concrete, plain, lightweight, per inch of thickness .....	8½

**Table J-2**  
**UNIT DESIGN DEAD LOADS FOR RIBBED SLABS**

Ribbed slabs Depth, in inches (rib depth plus slab thickness)*	Pounds per square foot					
	Width of rib, in inches					
	4	5	6	7	8	9
12 inch clay-tile fillers (normal weight concrete):						
4 plus 2 .....	49	51	52	54	—	—
6 plus 2 .....	60	63	65	67	—	—
8 plus 2½ .....	79	82	85	87	—	—
10 plus 3 .....	96	100	103	106	—	—
12 plus 3 .....	108	112	116	120	—	—

\*Make appropriate allowances for tapered ends.

**Table J-2 (cont'd.)**  
**UNIT DESIGN DEAD LOADS FOR RIBBED SLABS**

Ribbed slabs Depth, in inches (rib depth plus slab thickness)*	Pounds per square foot					
	Width of rib, in inches					
	4	5	6	7	8	9
20 inch wide forms:						
6 plus 2½	45	48	50	50	—	—
8 plus 2½	51	54	57	60	—	—
10 plus 2½	57	60	64	68	—	—
12 plus 2½	63	67	72	76	—	—
14 plus 2½	—	74	79	84	—	—
16 plus 2½	—	—	88	93	98	—
20 plus 2½	—	—	—	111	118	—
30 inch wide forms:						
6 plus 2½	41	43	45	47	—	—
8 plus 2½	45	47	50	53	—	—
10 plus 2½	49	52	55	58	—	—
12 plus 2½	53	57	60	64	—	—
14 plus 2½	—	62	66	70	—	—
16 plus 2½	—	—	72	76	80	—
20 plus 2½	—	—	—	90	95	101
2-way clay-tile fillers (12 × 12):						
4 plus 2	61	62	64	—	—	—
6 plus 2	87	89	90	—	—	—
8 plus 2½	100	103	107	—	—	—
10 plus 3	121	126	131	—	—	—
12 plus 3	136	141	146	—	—	—

\*Make appropriate allowances for tapered ends.

**Table J-3**  
**UNIT DESIGN DEAD LOADS FOR WAFFLE SLABS**

Waffle slabs Depth, in inches (Rib depth plus slab thickness)	Pounds per square foot
19 × 19, 5 @ 24	
6 plus 2½	.66
8 plus 2½	.78
10 plus 2½	.85
12 plus 2½	1.01
30 × 30, 6 @ 36	
8 plus 3	.73
10 plus 3	.83
12 plus 3	.95
14 plus 3	1.06
16 plus 3	1.14
20 plus 3	1.35

**Table J-4**  
**UNIT DESIGN DEAD LOADS FOR FLOOR FINISH**

Floor finish	Pounds per square foot
Double $\frac{7}{8}$ inch wood on sleepers, light-concrete fill	19
Double $\frac{7}{8}$ inch wood on sleepers, stone-concrete fill	28
Single $\frac{7}{8}$ inch wood on sleepers, light-concrete fill	16
Single $\frac{7}{8}$ inch wood on sleepers, stone-concrete fill	25
3 inch wood block on mastic, no fill	10
1 inch cement finish on stone-concrete fill	32
1 inch terrazzo on stone-concrete fill	32
Marble and mortar on stone-concrete fill	33
Linoleum on stone-concrete fill	32
Linoleum on light-concrete fill	22
1½ inch asphalt mastic flooring	18
3 inch wood block on ½ inch mortar base	16
Solid flat tile on 1 inch mortar base	23
2 inch asphalt block, ½ inch mortar	30
1 inch terrazzo, 2 inch stone concrete	32
Floor finish tile per inch depth	12
Cement finish per inch depth	12
Gypsum slabs per inch depth	4
Precast concrete plank per inch depth	(as determined by test)
Hardwood flooring per inch depth	4
Underflooring per inch depth	3
Linoleum	2
Asphalt tile	2

**Table J-5**  
**UNIT DESIGN DEAD LOADS FOR WATERPROOFING**

Waterproofing	Pounds per square foot
Five-ply membrane	5

**Table J-6**  
**UNIT DESIGN DEAD LOADS FOR FLOOR FILL**

Floor fill	Pounds per square foot
Cinder fill, per inch	5
Cinder concrete, per inch	9
Lightweight concrete, per inch	7
Sand, per inch	8
Stone concrete, per inch	12

**Table J-7**  
**UNIT DESIGN DEAD LOADS FOR WOOD-JOIST FLOORS**

Wood-joint floors (no plaster)—double wood floor joist sizes in inches:	Pounds per square foot	
	12-in spacing	16-in spacing
2 × 6 .....	6	5
2 × 8 .....	6	6
2 × 10 .....	7	6
2 × 12 .....	8	7
3 × 6 .....	7	6
3 × 8 .....	8	7
3 × 10 .....	9	8
3 × 12 .....	11	9
3 × 14 .....	12	10

**Table J-8**  
**UNIT DESIGN DEAD LOADS FOR MATERIALS**

Materials	Pounds per cubic foot
Cast-stone masonry (cement, stone, sand) .....	144
Cinder fill .....	57
Concrete, plain:	
Cinder .....	108
Expanded-slag aggregate .....	100
Haydite (burned-clay aggregate) .....	90
Slag .....	132
Stone (including gravel) .....	144
Vermiculite and perlite aggregate, nonload-bearing .....	25-50
Other light aggregate, load-bearing .....	70-105
Concrete, reinforced:	
Cinder .....	111
Slag .....	138
Stone (including gravel) .....	150
Earth (dry) .....	96
Earth (damp) .....	108
Earth (wet) .....	120
Cork .....	15
Masonry, ashlar:	
Granite .....	168
Limestone, crystalline .....	168
Limestone, oolitic .....	135
Marble .....	173
Sandstone .....	144
Masonry, rubble mortar:	
Granite .....	153
Limestone, crystalline .....	147
Limestone, oolitic .....	138
Marble .....	156
Sandstone .....	137
Rubber stone masonry .....	156
Terra cotta, architectural:	
Voids filled .....	120
Voids unfilled .....	72

**Table J-8 (cont'd.)**  
**UNIT DESIGN DEAD LOADS FOR MATERIALS**

Materials	Pounds per cubic foot
Timber, seasoned:	
Ash, commercial white .....	41
Cypress, southern .....	32
Fir, Douglas, coast region .....	34
Oak, commercial reds and whites .....	45
Redwood .....	28
Spruce, red, white, and Sitka .....	28
Southern pine, short leaf .....	39
Southern pine, long leaf .....	48
Timber, hemlock .....	30

**Table J-9**  
**UNIT DESIGN DEAD LOADS FOR ROOF AND WALL COVERINGS**

Roof and wall coverings	Pounds per square foot
Asphalt shingles .....	2
Cement asbestos shingles .....	4
Cement tile .....	16
Clay tile (for mortar add 10 lb):	
2 inch book tile .....	12
3 inch book tile .....	20
Roman .....	12
Spanish .....	19
Ludowici .....	10
Composition:	
Three-ply ready roofing .....	1
Four-ply felt and gravel .....	5½
Five-ply felt and gravel .....	6
Copper or tin .....	1
Corrugated asbestos-cement roofing .....	4
Fiberboard, ½ inch .....	¾
Formed sheet steel .....	1-3
Formed steel decking .....	(see manufacturer)
Gypsum sheathing, ½ inch .....	2
Rigid insulation, ½ inch .....	¾
Sheet lead .....	3
Skylight, metal frame, ¾ inch wire glass .....	8
Slate, 3/16 inch .....	7
Slate, ¼ inch .....	10
Spanish tile .....	20
Wood sheathing, per inch thickness .....	3
Wood shingles .....	3

**Table J-10**  
**UNIT DESIGN DEAD LOADS FOR SUSPENDED CEILINGS**

Suspended ceilings	Pounds per square foot
Cement on wood lath	12
Cement on metal lath	15
Gypsum on wood or metal lath	10
Plaster on tile or concrete	5
Suspended metal lath and gypsum plaster	10
Suspended metal lath and cement plaster	15
Plaster on wood lath	8

**Table J-11**  
**UNIT DESIGN DEAD LOADS FOR UNPLASTERED WALLS AND PARTITIONS**

Walls and partitions (unplastered)	Pounds per square foot
4 inch clay brick, high absorption	34
4 inch clay brick, medium absorption	39
4 inch clay brick, low absorption	46
4 inch sand-lime brick	38
4 inch concrete brick, heavy aggregate	46
4 inch concrete brick, light aggregate	33
8 inch clay brick, high absorption	69
8 inch clay brick, medium absorption	79
8 inch clay brick, low absorption	89
8 inch sand-lime brick	74
8 inch concrete brick, heavy aggregate	89
8 inch concrete brick, light aggregate	68
12 inch common brick	120
12 inch pressed brick	130
12 inch sand-lime brick	105
12½ inch concrete brick, heavy aggregate	130
12½ inch concrete brick, light aggregate	98
17 inch clay brick, high absorption	134
17 inch clay brick, medium absorption	155
17 inch clay brick, low absorption	173
17 inch sand-lime brick	138
17 inch concrete brick, heavy aggregate	174
17 inch concrete brick, light aggregate	130
22 inch clay brick, high absorption	168
22 inch clay brick, medium absorption	194
22 inch clay brick, low absorption	216
22 inch sand-lime brick	173
22 inch concrete brick, heavy aggregate	216
22 inch concrete brick, light aggregate	160
4 inch brick, 4 inch load-bearing structural clay tile backing	60
4 inch brick, 8 inch load-bearing structural clay tile backing	75
8 inch brick, 4 inch load-bearing structural clay tile backing	102
8 inch combination brick and concrete block	72
12 inch combination brick and concrete block	90
8 inch load-bearing structural clay tile	42
12 inch load-bearing structural clay tile	58
8 inch concrete block, heavy aggregate	55

Table J-11 (cont'd.)  
**UNIT DESIGN DEAD LOADS FOR UNPLASTERED WALLS AND PARTITIONS**

Walls and partitions (unplastered)	Pounds per square foot
12 inch concrete block, heavy aggregate	85
8 inch concrete block, light aggregate	38
12 inch concrete block, light aggregate	55
2 inch furring tile, one side of masonry wall, add to above figures	12
4 inch hollow concrete block—stone aggregate	30
lightweight	20
6 inch hollow concrete block—stone aggregate	42
lightweight	30
8 inch hollow concrete block—stone aggregate	55
lightweight	38
10 inch hollow concrete block—stone aggregate	62
lightweight	46
12 inch hollow concrete block—stone aggregate	85
lightweight	55
4 inch solid concrete block—stone aggregate	45
lightweight	34
6 inch solid concrete block—stone aggregate	50
lightweight	37
8 inch solid concrete block—stone aggregate	67
lightweight	48
10 inch solid concrete block—stone aggregate	84
lightweight	62
12 inch solid concrete block—stone aggregate	108
lightweight	72
4 inch load-bearing clay tile	24
6 inch load-bearing clay tile	36
2 inch non-load-bearing clay tile	11
3 inch non-load-bearing clay tile	18
4 inch non-load-bearing clay tile	20
6 inch non-load-bearing clay tile	30
8 inch non-load-bearing clay tile	36
10 inch non-load-bearing clay tile	40
4 inch non-load-bearing hollow concrete block	20
6 inch non-load-bearing hollow concrete block	30
8 inch non-load-bearing hollow concrete block	40
T.C. 1½ inch split terra cotta furring	8
2 inch split terra cotta furring	10
3 inch split terra cotta furring	12
2 inch hollow gypsum block	9½
3 inch hollow gypsum block	10
4 inch hollow gypsum block	15
5 inch hollow gypsum block	18
6 inch hollow gypsum block	24
2 inch solid gypsum block	12
3 inch solid gypsum block	18
4 inch solid gypsum block	24
2 inch facing tile	15
4 inch facing tile	25
6 inch facing tile	38
2 inch solid plaster	20
4 inch solid plaster	32
4 inch hollow plaster	22
Wood studs 2 × 4, unplastered	4
Wood studs 2 × 4, plastered one side	12
Wood studs 2 × 4, plastered two sides	20
4 inch glass block	18

**Table J-12**  
**UNIT DESIGN DEAD LOADS FOR LATH AND PLASTER PARTITIONS**

Lath and plaster partitions	Pounds per square foot
2 inch solid cement on metal lath . . . . .	25
2 inch solid gypsum on metal lath . . . . .	18
2 inch solid gypsum on gypsum lath . . . . .	18
2 inch metal studs gypsum and metal lath both sides . . . . .	18
3 inch metal studs gypsum and metal lath both sides . . . . .	19
4 inch metal studs gypsum and metal lath both sides . . . . .	20
6 inch wood studs plaster and wood lath, both sides . . . . .	18
6 inch wood studs plaster and metal lath, both sides . . . . .	18
6 inch wood studs plaster and plaster boards, both sides . . . . .	18
6 inch wood studs unplastered gypsum board, both sides (dry wall) . . . . .	10

**Table J-13**  
**UNIT DESIGN DEAD LOADS FOR PLASTER WORK**

Plaster work	Pounds per square foot
Gypsum (one side) . . . . .	5
Cement (one side) . . . . .	10
Gypsum on wood lath . . . . .	8
Gypsum on metal lath . . . . .	8
Gypsum on plaster board or fiber board . . . . .	8
Cement on wood lath . . . . .	10
Cement on metal lath . . . . .	10



# APPENDIX K

## UNIT WORKING STRESSES FOR ORDINARY MATERIALS

### K-100.0 General

**K-100.1 Scope:** Unless otherwise specified herein, the allowable working stresses and design capacities for ordinary materials, as defined in Sections 201.0 and 719.0, shall be reduced ten per cent below the recommended values of the accepted engineering standards listed in Appendix B. When the structural material is identified in regard to manufacture and grade, and the identification is accompanied by satisfactory mill tests or the strength and stress grade of the materials are otherwise confirmed to the satisfaction of the building official, the allowable working stresses and design capacities may be increased to comply with the accepted engineering standards.

### K-101.0 Masonry stresses

**K-101.1 Mortar for unit masonry:** Mortar for unit masonry shall comply with either the proportion specifications as set out in Section 815.2, or shall meet the property specifications of the accepted material standard listed in Appendix C. Unless laboratory data are presented to show that the mortar meets the requirements of the property specifications, the proportion specifications shall govern.

**K-101.2 Compressive stresses:** Except as permitted in other sections of this code, the compressive stresses in masonry shall not exceed the values as shown in Table K-101.

**K-101.3 Shear and tensile stresses:** Except as permitted in other sections of this code, the allowable shear or tensile stresses in masonry shall not exceed the values permitted in the accepted engineering practice standards listed in Appendix B.

### K-102.0 Concrete

**K-102.1 Concrete proportions:** Concrete shall comply with either the maximum permissible water-cement ratios and minimum cement contents of Table K-102; or shall comply with the standard Building Code Requirements for Reinforced Concrete listed in Appendix B for proportions based on strength tests of trial batches; or of concrete from the production facility representing similar materials and conditions.

**K-102.2 Capacities and stresses:** The allowable design capacities or working stresses for ordinary materials shall not exceed those in Section 840.0 for plain concrete and in the standard Building Code Requirements for Reinforced Concrete listed in Appendix B, subject to the ten per cent reduction specified for ordinary materials.

### K-103.0 Reinforced gypsum concrete

**K-103.1 Stresses:** When ordinary materials are used, the allowable working stresses shall be based on the following proportions, measured dry by weight with sufficient water to make a plastic mix that will fill the forms: 100 per cent neat calcined gypsum; 97 per cent gypsum and 3 per cent wood chips, shavings or

**Table K-101**  
**ALLOWABLE COMPRESSIVE STRESSES GROSS CROSS-SECTIONAL AREA**  
 (Except as noted)

Type of masonry and grade of masonry unit (psi gross area)	Type of mortar			
	M	S	N	O
	psi	psi	psi	psi
Solid masonry of brick and other solid units of clay or shale; sand lime or concrete:				
8000 plus psi	400	350	300	200
from 4500 or 8000 psi	250	225	200	150
from 2500 to 4500 psi	175	160	140	100
from 1500 to 2500 psi	125	115	100	75
Grouted masonry of solid masonry units:				
from 4500 to 8000 psi	350	275	200	—
from 2500 to 4500 psi	275	215	155	—
from 1500 to 2500 psi	225	175	125	—
Solid masonry of solid concrete masonry units:				
1800 plus psi	175	160	140	100
from 1200 to 1800 psi	125	115	100	75
Masonry of hollow units	85	75	70	—
Hollow walls (cavity or masonry bonded) <sup>a</sup>				
Solid masonry units				
2500 plus psi	140	130	110	—
from 1500 to 2500 psi	100	90	80	—
Hollow masonry units	70	60	55	—
Stone ashlar masonry				
Granite	800	720	640	500
Limestone or marble	500	450	400	325
Sandstone or cast stone	400	360	320	250
Rubble stone, coursed, rough or random	140	120	100	80

**Note a.** On gross cross-sectional area of wall minus area of cavity between wythes. The allowable comprehensive stresses for cavity walls are based upon the assumption that the floor loads bear upon but one (1) of the two (2) wythes. Where hollow walls are loaded concentrically, the allowable stresses may be increased by twenty-five (25) per cent.

**Table K-102**  
**MAXIMUM WATER-CEMENT RATIOS AND MINIMUM CEMENT CONTENTS**

Specified compressive strength*(psi)	Minimum sacks of cement per cubic yard of concrete	Maximum permissible water-cement ratios			
		Non-air-entrained concrete		Air-entrained concrete	
		Absolute ratio by weight	U.S. gal. per 94 lb. bag of cement	Absolute ratio by weight	U.S. gal. per 94 lb. bag of cement
2500	5	0.65	7.3	0.54	6.1
3000	5½	0.58	6.6	0.46	5.2
3500	6	0.51	5.8	0.40	4.5

\*28 day strengths for cements meeting strength limits of ASTM C150, Type I, 1A, II or IIA and 7 day strengths for type III and IIIA.

fibers; and 87.5 per cent gypsum and 12.5 per cent wood chips, shavings or fibers; with ultimate compressive strengths of 1,800, 1,000 and 500 pounds per square inch respectively.

The working stresses shall not exceed the values prescribed in the standard for Reinforced Gypsum Concrete listed in Appendix B subject to the ten per cent reduction prescribed for ordinary materials.

### K-104.0 Steel reinforcement

**K-104.1 Stresses:** The allowable working stresses for reinforcement specified in the standard Building Code Requirements for Reinforced Concrete listed in Appendix B shall be used in all reinforced construction, including reinforced concrete, reinforced gypsum concrete and all forms of reinforced masonry, subject to the ten per cent reduction specified for ordinary, unidentified materials.

### K-105.0 Structural steel and cast steel

**K-105.1 Stresses:** The allowable working stresses for structural steel and cast steel contained in the Specification for Design, Fabrication and the Erection of Structural Steel for Buildings listed in Appendix B shall be used on all structural building construction, subject to the ten per cent reduction specified for ordinary, unidentified materials.

### K-106.0 Cast iron

**K-106.1 Stresses:** The maximum stress for cast iron shall be as indicated in Table K-106.

Table K-106  
CAST IRON STRESS

	Maximum stress in pounds per square inch
Tension .....	3,000
Extreme tension (fiber stress in bending) .....	3,000
Extreme compression (fiber stress in bending) .....	16,000
Shear .....	3,000
Column compression .....	9,000 minus $40 \frac{1}{r}$
Ratio $\frac{1}{r}$ not to exceed seventy (70)	

### K-107.0 Open-web steel joist

**K-107.1 Stresses:** The allowable working stresses specified for open-web steel joists shall be in accordance with the Standard Specifications for Steel Joist Construction listed in Appendix B. For all other steel joists, unless otherwise specifically approved and identified, the allowable working stresses specified by the standard shall be reduced ten per cent.

### **K-108.0 Cold formed steel construction**

**K-108.1 Stresses:** When ordinary materials which are not identified as to manufacture and grade are used, the allowable working stresses in the Specification for the Design of Cold-formed Steel Structural Members listed in Appendix B shall be reduced ten per cent.

### **K-109.0 Lumber**

**K-109.1 Stresses:** When the grade of lumber is not identified as provided in Section 719.0 for controlled materials, the maximum allowable working stresses for the species of lumber used shall be determined in accordance with the principles for stress grade lumber as set forth in National Design Specifications for Wood Construction listed in Appendix B.

# APPENDIX L

## LOAD DESIGN CRITERIA

### L-100.0 General

**L-100.1 Scope:** The load design criteria provided in this appendix shall be used to calculate, and effectively provide for, the loads and stresses acting upon a structure. The provisions of this appendix shall be used in conjunction with applicable sections of Article 7 in which they are referenced.

### L-101.0 Earthquake load design

**L-101.1 General:** When required to withstand lateral forces under Section 718.0, buildings and structures shall be designed in accordance with the following sections according to the zone in which they are located on the seismic probability map in Figure L-101.1.

**L-101.1.1 Application of provisions:** These lateral force requirements are intended to make buildings earthquake-resistive. The provisions apply to the buildings as a unit and also to all parts thereof, including the structural frame or walls, floor and roof systems, and other structural features. In specific cases, they may be interpreted or added to as to detail by rulings of the building official in order that the intent shall be fulfilled.

**L-101.1.2 Additions:** Where applicable, every addition to an existing building or structure shall be designed and constructed to resist and withstand the forces provided for herein, and in any case where an existing building or structure is increased in height all portions thereof affected by such increased height shall be reconstructed to resist and withstand the forces provided for herein.

**L-101.1.3 Alterations:** Where applicable, an existing building or structure shall not be altered or reconstructed in such a manner that the resistance to the forces provided for herein will be less than that before such alteration of reconstruction was made; provided, however, that this provision shall not apply to non-bearing partitions, and shall not apply to other minor alterations which are made in compliance with all requirements of this code.

**L-101.2 Plans and design data:** Where earthquake loads are applicable, a brief statement of the following items shall be included with each set of plans filed.

1. A summation of the dead and live load of the building, floor by floor, which was used in figuring the shear for which the building is designed.
2. A brief description of the bracing system used, the manner in which the designer expects such system to act and a clear statement of any assumptions used. Assumption as to location of all points of counterflexure in members must be stated.
3. Sample calculation of a typical bent or equivalent. For combined stresses due to the lateral forces and other loads, the allowable unit stresses and the allowable load in connections may be increased as provided in Section 717.0.

**L-101.3 Lateral force requirements:** Where earthquake loads are applicable, every building or structure and every portion thereof, and minor accessory building, except as exempted in Section 716.0, shall be designed and constructed to resist stresses produced by lateral forces as provided in this appendix.

Stresses shall be calculated as the effect of a force applied horizontally at each floor or roof level above the foundation. The force shall be assumed to come from any horizontal direction.

In those zones where wind, snow, or other loads impose a greater load than those provided herein, such other loads shall be provided for. It may be assumed that wind and earthquake loads will not occur simultaneously.

**L-101.4 Definitions:** The definitions listed below apply only to the provisions of this appendix.

**Space frame:** a three-dimensional structural system composed of interconnected members, other than shear or bearing walls, laterally supported so as to function as a complete self-contained unit with or without the aid of horizontal diaphragms or floor bracing systems.

**Space frame, vertical load-carrying:** A space frame designed to carry all vertical loads.

**Space frame, moment resisting:** A vertical load-carrying space frame in which the members and joints are capable of resisting design lateral forces by bending moments and column shears.

**Space frame, ductile moment resisting:** A space frame which complies with the requirements for a ductile moment-resisting space frame as given in Section L-101.11.

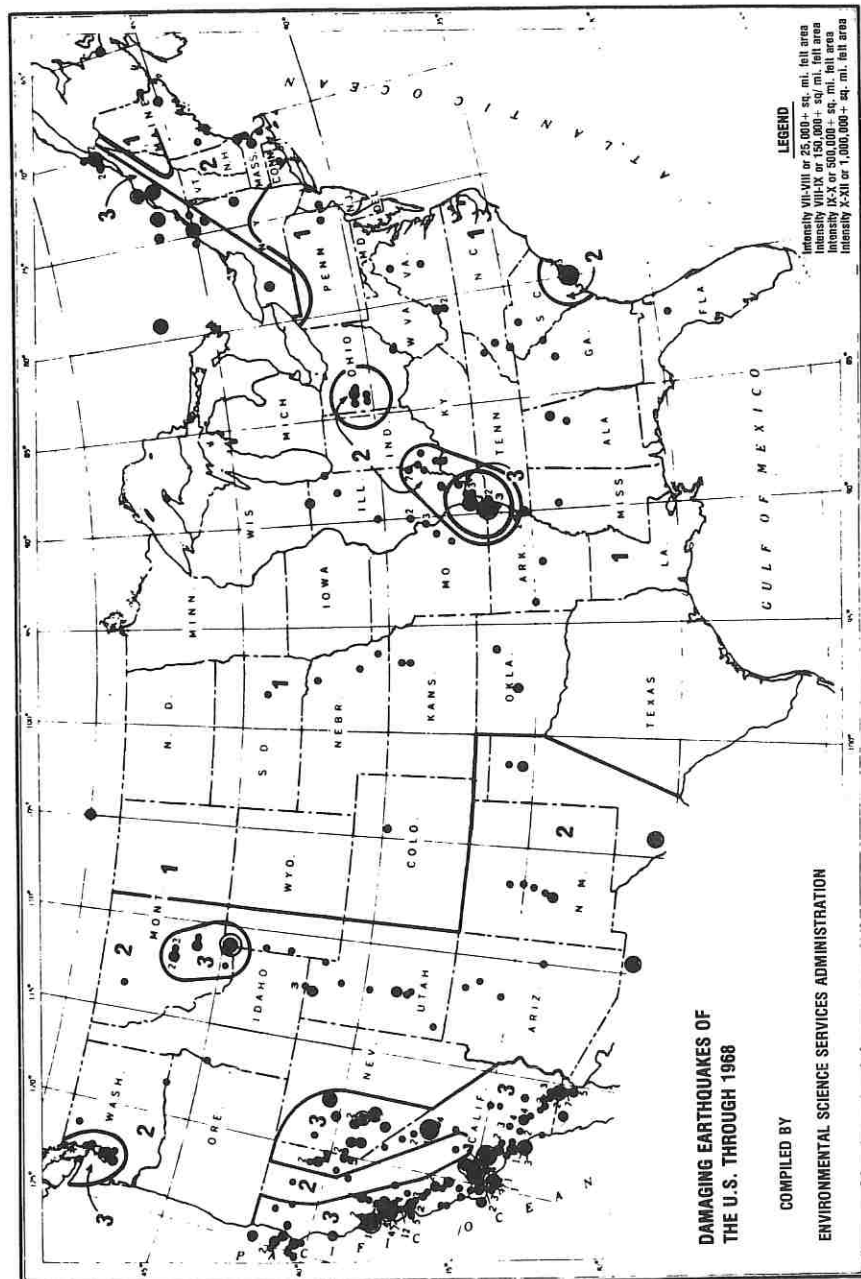
**Box system:** A structural system without a complete vertical load-carrying space frame. In this system, the required lateral forces are resisted by shear walls as hereinafter defined.

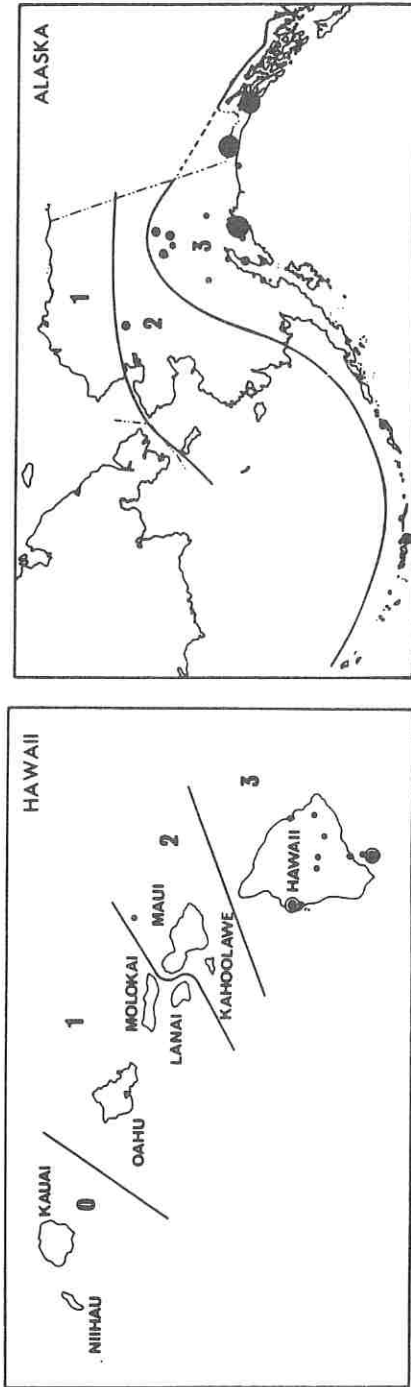
**Shear wall:** A wall designed to resist lateral forces parallel to the wall. Braced frames subjected primarily to axial stresses shall be considered as shear walls for the purpose of this definition.

**Lateral force resisting system:** That part of the structural system to which the lateral forces prescribed in Section L-101.5.1 are assigned.

**L-101.4.1 Symbols and notations:** The following symbols and notations apply only to the provisions of this appendix.

- C = Numerical coefficient for base shear as defined in Section L-101.5.2.
- C<sub>p</sub> = Numerical coefficient as defined in Section L-101.5.2 and set forth in Table L-101.5.2.
- D = The dimension of the building in feet in a direction parallel to the applied forces (also see Section L-101.10).
- D<sub>s</sub> = The plan dimension in feet of the vertical lateral force resisting system in the direction of the applied force.
- F<sub>i</sub>, F<sub>n</sub>, F<sub>x</sub> = Lateral force applied to level "i", "n", or "x" respectively.
- F<sub>p</sub> = Lateral forces on the part of the structure, and in the direction, under consideration.
- F<sub>t</sub> = That portion of "V" considered concentrated at the top of the structure, at the level "n". The remaining portion of the total base shear (V) shall be distributed over the height of the structure including level "n" according to equation L-1-5.
- h<sub>i</sub>, h<sub>n</sub>, h<sub>x</sub> = The height in feet above the base to level "i", "n", or "x" respectively.
- J = Numerical coefficient for base overturning moment as defined in Section L-101.9.
- J<sub>x</sub> = Numerical coefficient for overturning moment at level "x".
- K = Numerical coefficient as set forth in Table L-101.5.1.
- Level i = Level of the structure referred to by the subscript "i".
- Level n = That level which is uppermost in the main portion of the structure.
- Level x = That level which is under design consideration.
- M = The overturning moment at the base of the building or structure.





**Figure L-101.1**  
**DAMAGING EARTHQUAKES IN THE UNITED STATES THROUGH 1968**

**Note a.** Maps of the three separate areas of the United States which indicated earthquake risk zones to supplement coefficient Z. This zoning was superimposed on maps showing the damaging earthquakes of the United States through 1968 that were compiled and supplied by the National Ocean Survey. The earthquake risk zones were determined by the ANSI Committee A58.

**Note b.** Large number represents zone classification: Zone 0, no damage; Zone 1, minor damage; Zone 2, moderate damage; Zone 3, major damage. Small number next to dots represents approximate number of recorded earthquakes in area of the intensity shown by size of dot.



- $M_x$  = The overturning moment at level "x".  
 $N$  = The total number of stories above exterior grade to level "n".  
 $T$  = Fundamental period of vibration of the building or structure in seconds in the direction under consideration.  
 $V$  = The total lateral force or shear at the base.

$$V = F_t + \sum_{i=1}^n F_i \text{ where } i = 1 \text{ designates first level above the base}$$

$$W = \text{The total dead load } W = \sum_{i=1}^n W_i$$

**Exception:**  $W$  shall be equal to the total dead load plus 25 per cent of the floor live load in storage and warehouse occupancies.

$W_i, W_x$  = That portion of  $W$  which is located at or is assigned to level "i" or "x" respectively

$W_p$  = The weight of a portion of a structure

$Z$  = Numerical coefficient dependent upon the zone as determined by the maps in Figure L-101.1. For locations in Zone 1, " $Z$ " shall be equal to 0.25. For locations in Zone 2, " $Z$ " shall be equal to 0.50. For locations in Zone 3, " $Z$ " shall be equal to 1.0.

### L-101.5 Minimum earthquake forces for structures

**L-101.5.1 Total lateral force and distribution of lateral force:** Every structure shall be designed and constructed to withstand minimum total lateral seismic forces assumed to act non-concurrently in the direction of each of the main axes of the structure in accordance with the following formula:

$$V = ZKCW \quad (\text{Equation L-1-1})$$

The value of  $K$  shall be not less than that in Table L-101.5.1. The value of  $C$  shall be determined in accordance with the following formula:

$$C = 0.05 \div \sqrt[3]{T} \quad (\text{Equation L-1-2})$$

**Exception:**  $C$  shall be 0.10 for all one- and two-story buildings.

$T$  is the fundamental period of vibration of the structure in seconds in the direction under consideration. Properly substantiated technical data for establishing the period  $T$  for the contemplated structure may be submitted. In the absence of such data, the value  $T$  for buildings shall be determined by the following formula:

$$T = 0.05 h_n \div \sqrt{D} \quad (\text{Equation L-1-3})$$

**Exception:** In all buildings in which the lateral force resisting system consists of a moment-resisting space frame which resists 100 per cent of the required lateral forces and which frame is not enclosed by or adjoined by more rigid elements which would tend to prevent the frame from resisting lateral forces:

$$T = 0.10 N \quad (\text{Equation L-1-3A})$$

The total lateral force " $V$ " shall be distributed in the height of the structure in the following manner:

$$F_t = .004V (h_n \div D_s)^2 \quad (\text{Equation L-1-4})$$

$F_t$  need not exceed 0.15 " $V$ " and may be considered as 0 for values  $(h_n \div D_s)$  of 3 or less, and

$$F_x = (V - F_t) w_x h_x \div \sum_{i=1}^n w_i h_i \quad (\text{Equation L-1-5})$$

**Exception:** One- and two-story buildings shall have uniform distribution. At each level designated as "x", the force  $F_x$  shall be applied over the area of the building in accordance with the mass distribution on that level.

**L-101.5.2 Lateral force on parts or portions of buildings and other structures:** Parts or portions of buildings or structures and their anchorage shall be designed for lateral forces in accordance with the following formula:

$$F_p = ZC_pW_p \quad (\text{Equation L-1-6})$$

The values of  $C_p$  are in Table L-101.5.2. The distribution of these forces shall be according to the gravity loads pertaining thereto.

**L-101.5.3 Pile foundations and caisson footings:** Individual pile and caisson footings of every building or structure shall be interconnected by ties, each of which can carry by tension and compression a horizontal force equal to 10 per cent of the larger pile cap loading, unless it can be demonstrated that equivalent restraint can be provided by other means.

**L-101.6 Distribution of horizontal shear:** Total shear in any horizontal plane shall be distributed to the various elements of the lateral force resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements that are assumed not to be part of the lateral force-resisting system may be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design.

**L-101.7 Drift:** Lateral deflections or drift of a story relative to its adjacent stories shall be considered in accordance with accepted engineering practice.

**Table L-101.5.1**  
**HORIZONTAL FORCE FACTOR "K" FOR BUILDINGS**  
**OR OTHER STRUCTURES<sup>1</sup>**

Type or arrangement of resisting elements	Value of K <sup>2</sup>
All building framing systems except as hereinafter classified	1.00
Buildings with a box system as defined in Section L-101.4	1.33
Buildings with a dual bracing system consisting of a ductile moment resisting space frame and shear walls designed in accordance with the following criteria: 1. The frames and shear walls shall resist the total lateral force in accordance with their relative rigidities considering the interaction of the shear walls and frames. 2. The shear walls acting independently of the ductile moment resisting space frame shall resist the total required lateral force. 3. The ductile moment resisting space frame shall have the capacity to resist not less than 25 per cent of the required lateral force.	0.80
Buildings with a ductile moment resisting space frame designed in accordance with the following criteria: the ductile moment resisting space frame shall have the capacity to resist the total required lateral force.	0.67
Elevated tanks plus full contents, on four or more crossbraced legs and not supported by a building <sup>3,4,5</sup>	3.00
Structures other than buildings and other than those set forth in Table L-101.5.2	2.00

**Note 1.** Where wind load would produce higher stresses, these loads shall be used in lieu of the loads resulting from earthquake forces.

**Note 2.** See maps in Figure L-101.1 for seismic probability zones and definition of "Z" as specified in Section L-101.4.1.

**Note 3.** The minimum value of "KC" shall be 0.12 and the maximum value of "KC" need not exceed 0.25.

**Note 4.** For overturning, the factor "J" as specified in Section L-101.9 shall be 1.00.

**Note 5.** The torsional requirements of Section L-101.8 shall apply

**L-101.8 Horizontal torsional moments:** Provisions shall be made for the increase in shear resulting from the horizontal torsion due to an eccentricity between the center of mass and the center of rigidity. Negative torsional shears shall be neglected. Where the vertical resisting elements depend on diaphragm action for shear distribution at any level, the shear resisting elements shall be capable of resisting a torsional moment assumed to be equivalent to the story shear acting with an eccentricity of not less than five percent of the maximum building dimension at that level.

**L-101.9 Overturning:** Every building or structure shall be designed to resist the overturning effects caused by the wind forces and related requirements, or the earthquake forces specified in this appendix, whichever governs.

**Table L-101.5.2**  
**HORIZONTAL FORCE FACTOR "C<sub>p</sub>" FOR PARTS**  
**OR PORTIONS OF BUILDINGS OR OTHER STRUCTURES**

Part or portion of buildings	Direction of force	Value of C <sub>p</sub>
Exterior bearing and nonbearing walls, interior bearing walls and partitions, interior nonbearing walls and partitions over 10 feet in height, masonry fences over 6 feet in height.	Normal to flat surface	0.20
Cantilever parapet and other cantilever walls, except retaining walls.	Normal to flat surface	1.00
Exterior and interior ornamentations and appendages	Any direction	1.00
When connected to or a part of a building: towers, tanks, towers and tanks plus contents, chimneys, smokestacks, and penthouses	Any direction	0.20 <sup>1</sup>
When resting on the ground, tank plus effective mass of its contents	Any direction	0.10
Floors and roofs acting as diaphragms <sup>2</sup>	Any direction	0.10
Connections for exterior panels or for elements complying with Section L-101.12.5	Any direction	2.00

**Note 1.** When  $\frac{h_n}{D}$  of any building is equal to or greater than five to one, increase value by 50 percent.

**Note 2.** Floors and roofs acting as diaphragms shall be designed for a minimum value of C<sub>p</sub> of 10 per cent applied to loads tributary from that story unless a greater value of C<sub>p</sub> is required by the basic seismic formula  $V = ZKW$ .

**Exception:** The axial loads from earthquake force on vertical elements and footings in every building or structure may be modified in accordance with the following provisions.

1. The overturning moment (M) at the base of the building or structure shall be determined in accordance with the following formula:

$$M = J(F_t h_n + \sum_{i=1}^n F_i h_i) \quad (\text{Equation L-1-7})$$

$$\text{where } J = 0.6 \div \sqrt[3]{T^2} \quad (\text{Equation L-1-8})$$

The value of "J" need not be more than 1.00.

- For structures other than buildings, the value of "J" shall not be less than 0.45, and the overturning moment ( $M_x$ ) at any level designated as "x" shall be determined in accordance with the following formula:

$$M_x = J_x[F_t(h_n - h_x) + \sum_{i=x}^n F_i(h_i - h_x)] \quad (\text{Equation L-1-9})$$

$$\text{where } J_x = J + (1 - J)(h_x \div h_n)^3 \quad (\text{Equation L-1-10})$$

At any level, the incremental changes of the design overturning moment, in the story under consideration, shall be distributed to the various resisting elements in the same proportion as the distribution of the shears in the resisting system. Where either vertical members are provided which are capable of partially resisting the overturning moments, a redistribution may be made to these members if framing members of sufficient strength and stiffness to transmit the required loads are provided.

Where a vertical resisting element is discontinuous, the overturning moment carried by the lowest story of that element shall be carried down as loads to the foundation.

**L-101.10 Setbacks:** Buildings having setbacks wherein the plan dimension of the tower in each direction is at least 75 per cent of the corresponding plan dimension of the lower part may be considered as a uniform building without setbacks for the purpose of determining seismic forces.

For other conditions of setbacks, the tower shall be designed as a separate building using the larger of the seismic coefficients at the base of the tower determined by considering the tower as either a separate building for its own height or as part of the overall structure. The resulting total shear from the tower shall be applied at the top of the lower part of the building which shall be otherwise considered separately for its own height.

**L-101.11 Structural systems:** Buildings more than 160 feet in height shall have ductile moment-resisting space frames which (including connections) are capable of resisting not less than 25 per cent of the required seismic force for the structure as a whole. All buildings designed with a horizontal force factor "K" of 0.67 or 0.80 shall be ductile moment-resisting space frames.

#### Exceptions

- Buildings more than 160 feet in height in Zone 1 may have shear walls or braced frames in lieu of a ductile moment-resisting space frame provided a K value of 1.00 or 1.33 is utilized in the design.
- Other structural systems may be approved by the building official when evidence is submitted showing that adequate energy absorption and ductility are provided to withstand the anticipated earthquakes based on a seismicological evaluation for the location.

Moment-resisting space frames and ductile moment-resisting space frames may be enclosed by or adjoined by more rigid elements which would tend to prevent the space frame from resisting lateral forces where it can be shown that the action or failure of the more rigid elements will not impair the vertical and lateral load resisting ability of the space frame.

The necessary ductility for a ductile moment-resisting space frame shall be provided by a frame which will incorporate established criteria\* for achieving ductility in the elastic and inelastic range. Shear walls in buildings where "K" =

0.80 shall be constructed to achieve ductile systems in accordance with established criteria.<sup>o</sup>

#### **L-101.12 Design requirements**

**L-101.12.1 Building separations:** All portions of structures shall be designed and constructed to act as an integral unit in resisting horizontal forces unless separated structurally by a distance sufficient to avoid contact under deflection from seismic action or wind forces.

**L-101.12.2 Minor alterations:** Minor structural alterations may be made in existing buildings and other structures; but the resistance to lateral forces shall be not less than that before such alterations were made, unless the building as altered meets the requirements of this appendix.

**L-101.12.3 Structural elements:** All elements within the structure which are considered to resist seismic forces or movement and/or are connected so as to participate with the structural system shall be designed in accordance with accepted structural practice.

**L-101.12.4 Combined vertical and horizontal forces:** In computing the effect of seismic force in combination with vertical loads, gravity load stresses induced in members by dead load plus design live load, except roof live load and snow load, shall be considered.

**L-101.12.5 Exterior elements:** Non-bearing non-shear wall panels or other elements which are attached to, or enclose the exterior, shall accommodate movements of the structure resulting from lateral forces or temperature changes. These panels or other elements shall be supported by approved means or by mechanical fasteners in accordance with the provisions described below.

1. Connections and panel joints shall allow for a relative movement between stories of not less than two times story drift caused by wind or seismic forces, or  $\frac{1}{4}$  inch, whichever is greater.
2. Connections shall have sufficient ductility and rotation capacity so as to preclude fracture or brittle failures at or near connections.
3. Connections to permit movement in the plane of the panel for story drift may be properly designed sliding connections using slotted or oversize holes or may be connections which permit movement by bending of ductile material.

## **L-102.0 Snow load design criteria**

**L-102.1 General:** Where buildings and structures or parts thereof are required by this code to withstand snow loads, the following criteria shall be used.

**L-102.1.1 Design snow load:** For purposes of snow load design, the snow load shall be determined from Figures L-102.1a, L-102.1b, or L-102.1c, whichever is applicable depending upon the intended use of the building or structure and its geographic location (see Section 711.0).

**L-102.1.2 Distribution:** For purposes of snow load design, the snow load distribution and related snow load coefficients shall be determined from Figures L-102.2a, L-102.2b or L-102.2c, whichever is applicable depending upon the slope of the roof.

Figure L-102.1a  
 SNOW LOAD IN POUND-FORCE PER SQUARE FOOT ON THE GROUND,  
 25-YEAR MEAN RECURRENCE INTERVAL

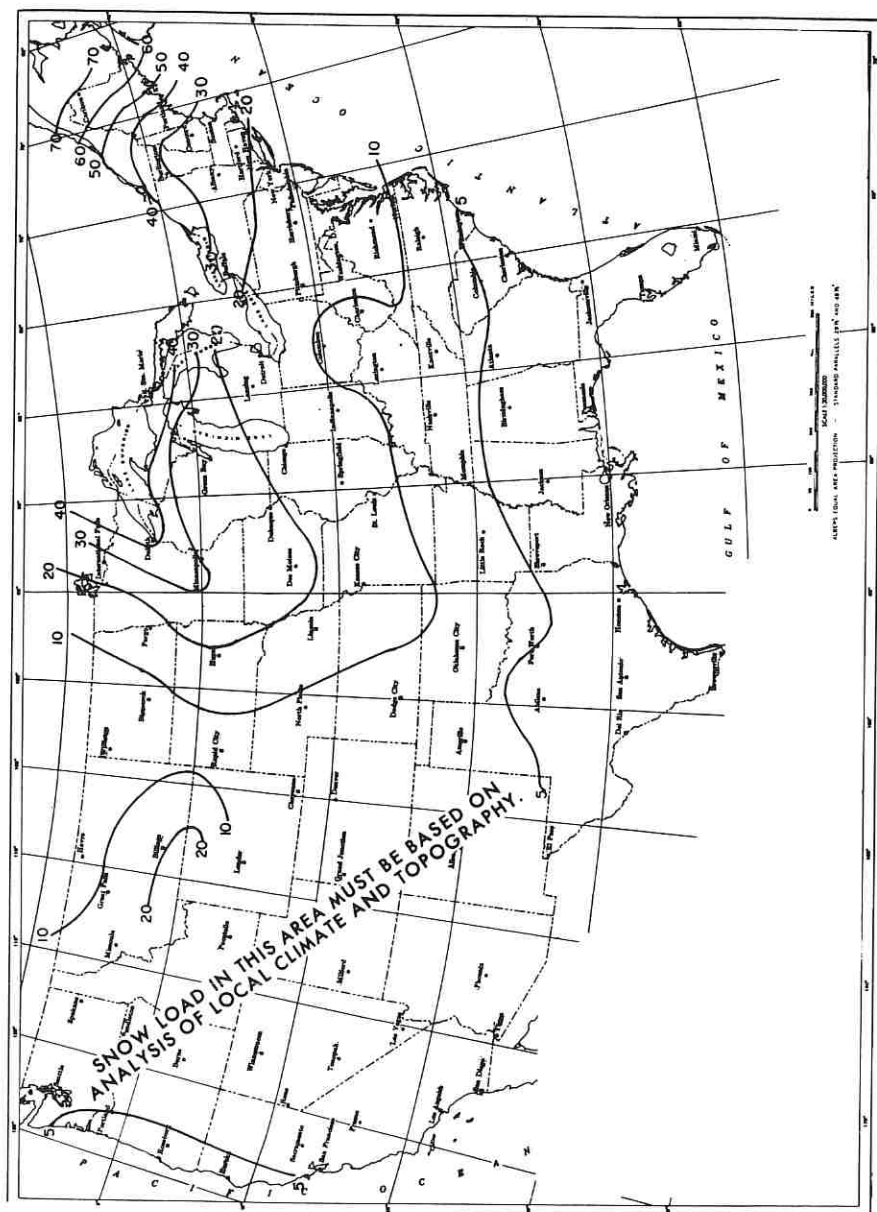


Figure L-102.1b

SNOW LOAD IN POUND-FORCE PER SQUARE FOOT ON THE GROUND,  
50-YEAR MEAN RECURRENCE INTERVAL

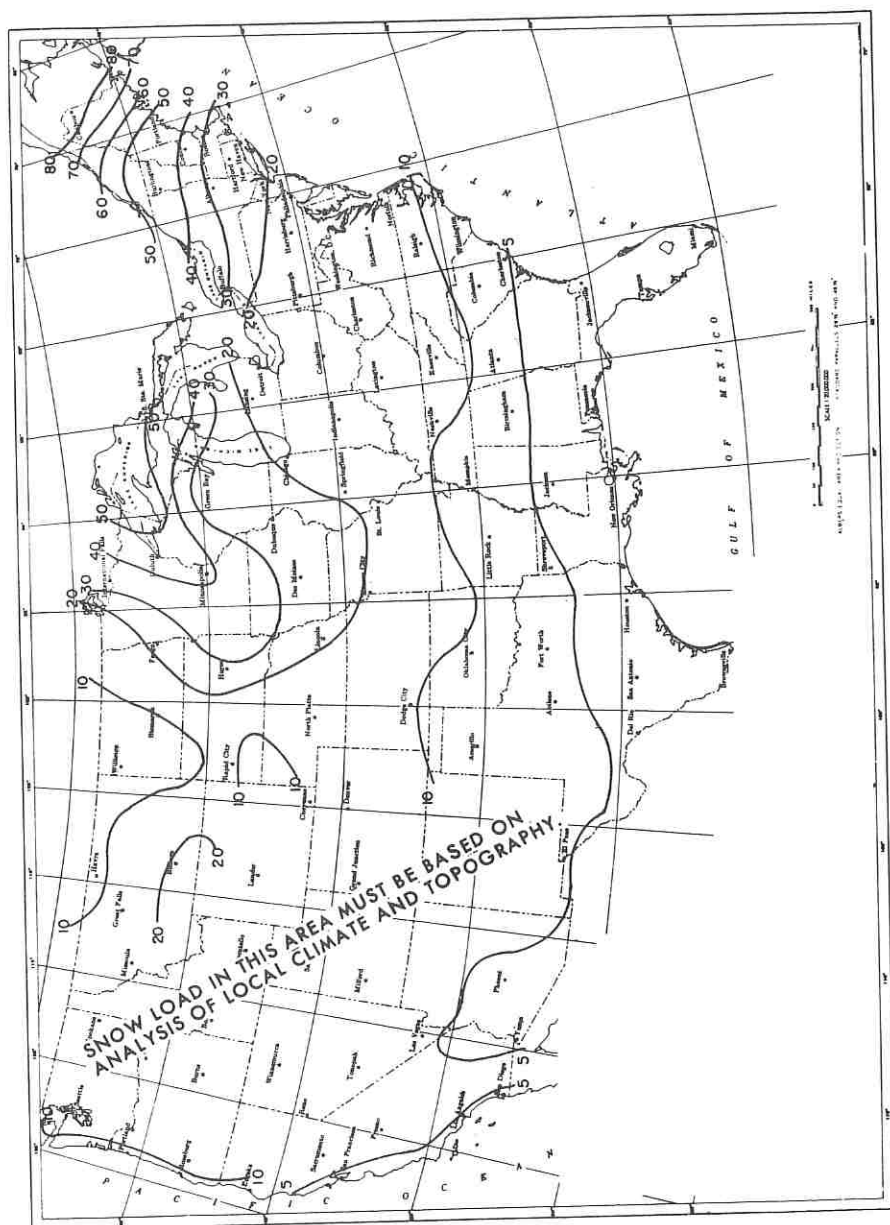




Figure L-102.1c  
SNOW LOAD IN POUND-FORCE PER SQUARE FOOT ON THE GROUND,  
100-YEAR MEAN RECURRENCE INTERVAL

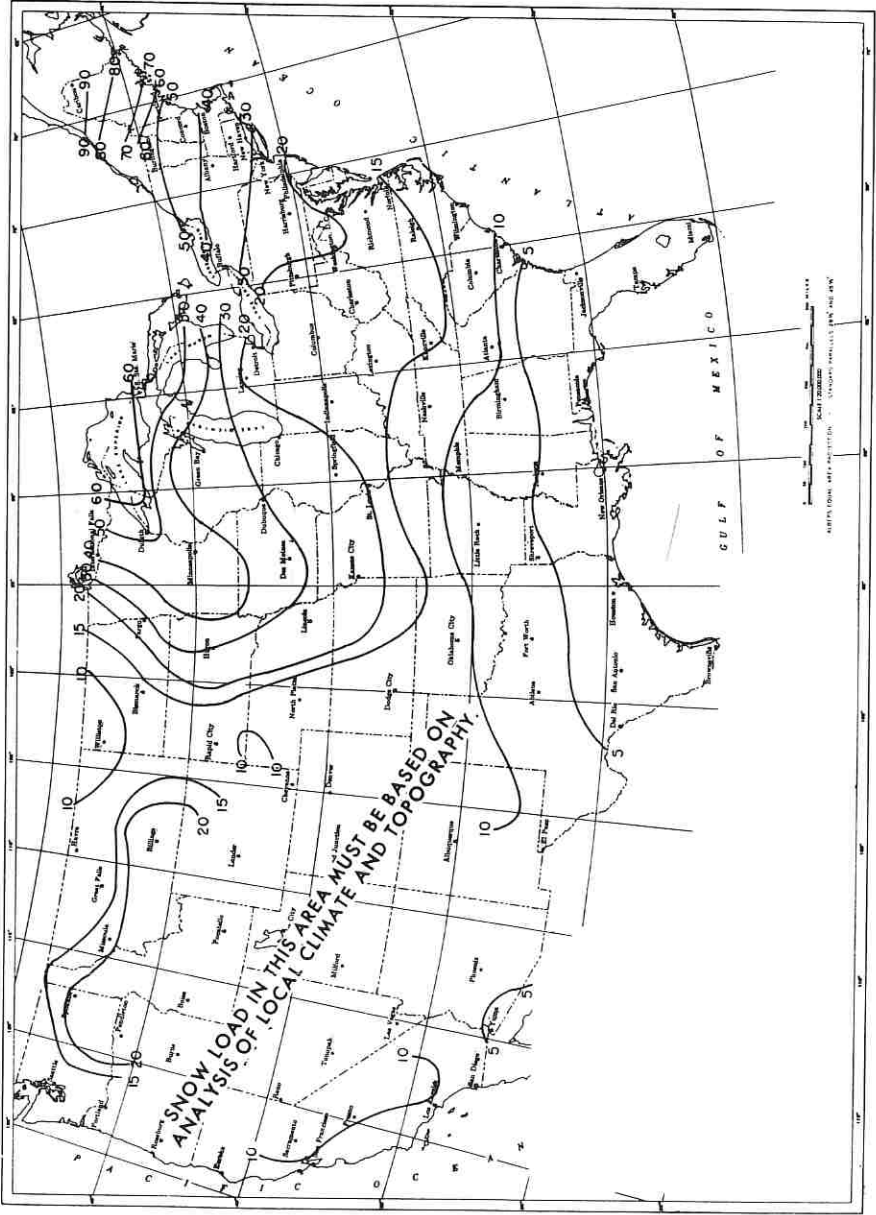
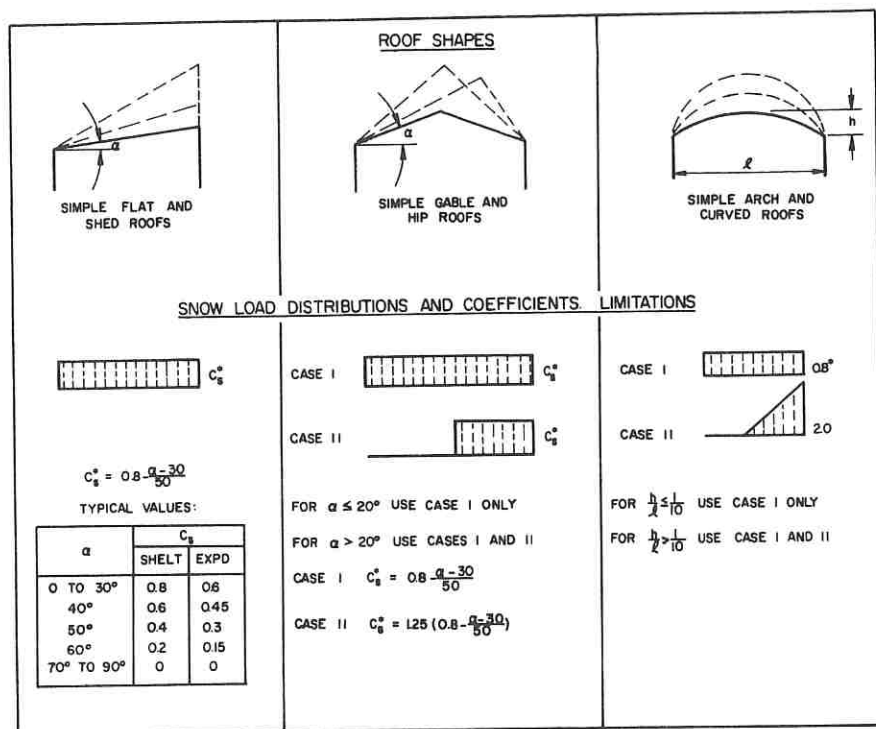


Figure L-102.2a  
SNOW LOAD DISTRIBUTIONS AND COEFFICIENTS

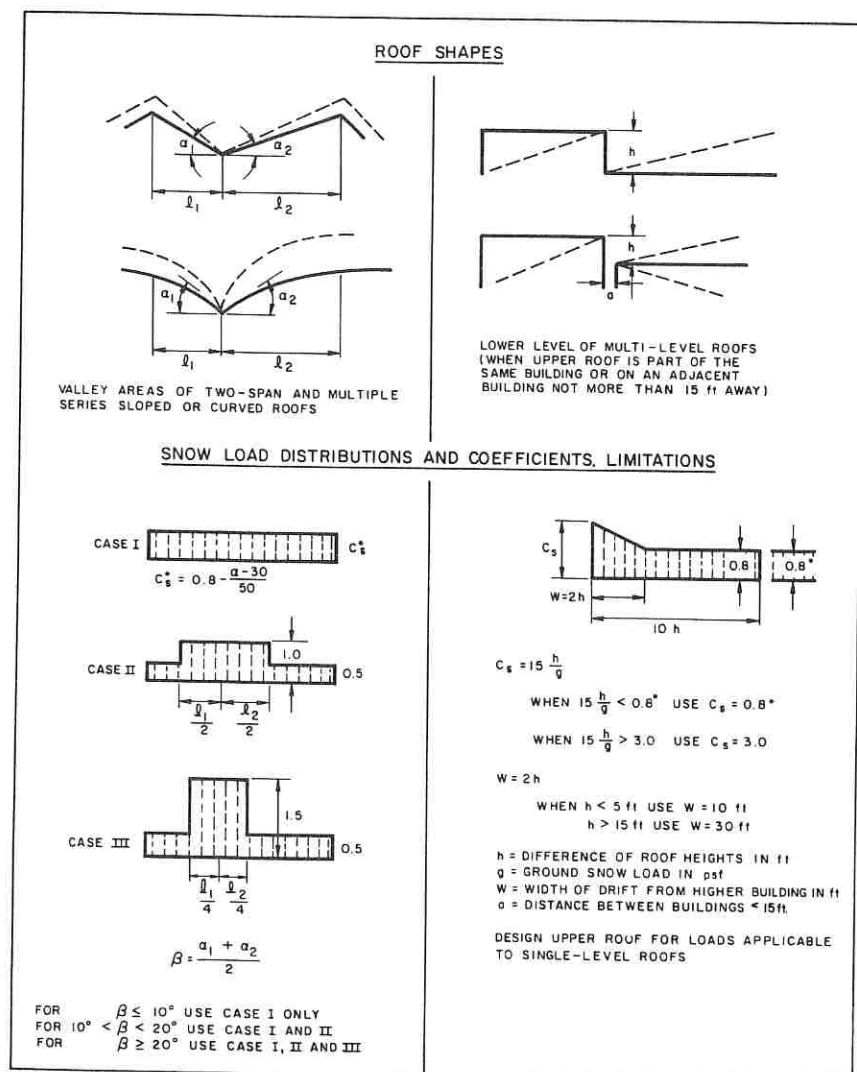


\*For roofs conforming to wind exposure requirements of 711.3.1, all values of  $C_s$  marked with an asterisk (\*) may be reduced 25 per cent.  
The term

$$a = \frac{30}{50}$$

is valid only for  $\alpha > 30$  degrees.

Figure L-102.2b  
SNOW LOAD DISTRIBUTIONS AND COEFFICIENTS



\*For roofs conforming to wind exposure requirements of 711.3.1, all values of  $C_s$  marked with an asterisk (\*) may be reduced 25 per cent.

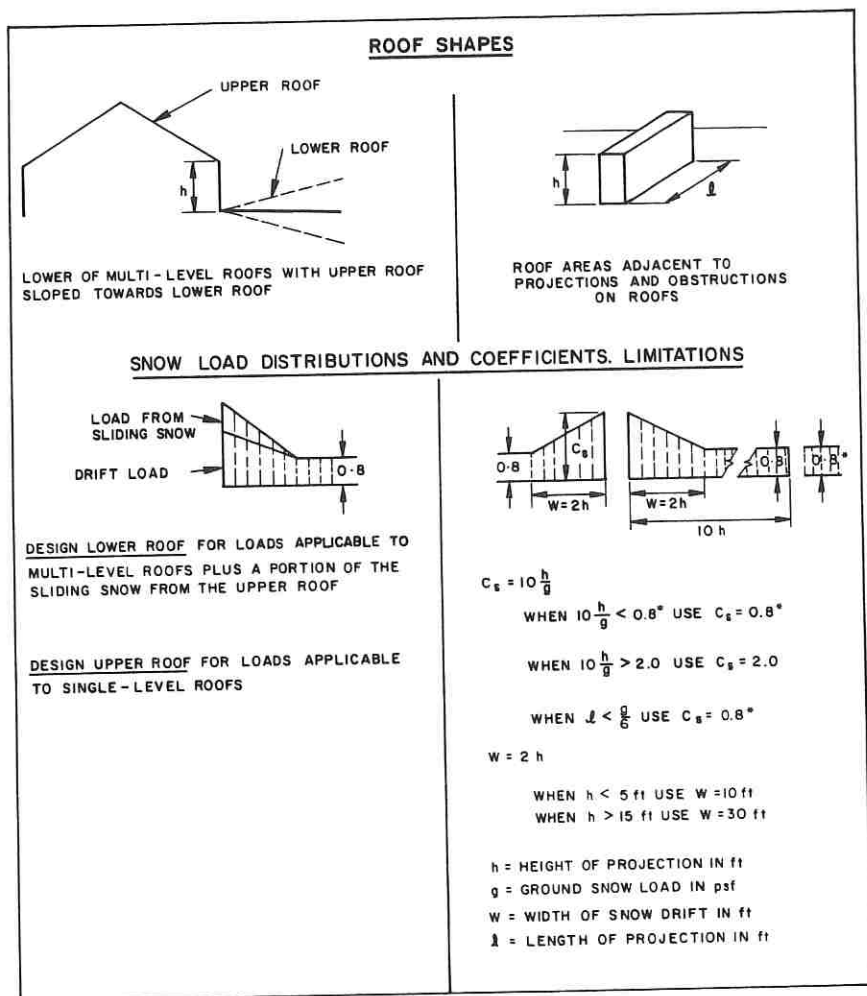
The term

$$a - 30$$

50

is valid only for a  $> 30$  degrees.

Figure L-102.2c  
SNOW LOAD DISTRIBUTIONS AND COEFFICIENTS



\*For roofs conforming to wind exposure requirements of 711.3.1, all values of  $C_s$  marked with an asterisk (\*) may be reduced 25 per cent.

# APPENDIX M

## RECOMMENDED NAILING SCHEDULE

Building element	Nail size and type	Number and location
Stud to sole plate . . . . .	8d common	4 toe-nail or
	16d common	2 direct nail
Stud to cap plate . . . . .	16d common	2 toe-nail or
		2 direct nail
Double studs . . . . .	10d common	12" o.c. direct
Corner studs . . . . .	16d common	24" o.c. direct
Sole plate to joist or blocking . . . . .	16d common	16" o.c.
Double cap plate . . . . .	10d common	16" o.c. direct
		nail
Cap plate laps . . . . .	10d common	2 direct-nail
Ribbon strip, 6" or less . . . . .	10d common	2 each direct
		bearing
Ribbon strip, 6" or more . . . . .	10d common	3 each direct
		bearing
Roof rafter to plate . . . . .	8d common	3 toe-nail
Roof rafter to ridge . . . . .	16d common	2 toe-nail or
		direct nail
Jack rafter to hip . . . . .	10d common	3 toe-nail or
	16d common	2 direct nail
Floor joists to studs . . . . .	10d common	5 direct or
(No ceiling joists)	10d common	3 direct
Floor joists to studs . . . . .	10d common	2 direct
(With ceiling joists)		
Floor joists to sill or girder . . . . .	8d common	3 toe-nail
Ledger strip . . . . .	16d common	3 each direct
		joist
Ceiling joists to plate . . . . .	16d common	3 toe-nail
Ceiling joists (laps over partition) . . . . .	10d common	3 direct nail
Ceiling joists (parallel to rafter) . . . . .	10d common	3 direct nail
Collar beam . . . . .	10d common	3 direct
Bridging to joists . . . . .	8d common	2 each direct
		end
Diagonal brace (to stud and plate) . . . . .	8d common	2 each direct
		bearing
Tail beams to headers . . . . .	20d common	1 each end
(when nailing permitted)		4 sq. ft.
		floor area
Header beams to trimmers . . . . .	20d common	1 each end
(when nailing permitted)		8 sq. ft.
		floor area
1" roof decking . . . . .	8d common	2 each direct
(6" or less in width)		rafter
1" roof decking . . . . .	8d common	3 each direct
(over 6" in width)		rafter

Building element	Nail size and type	Number and location
1" sub-flooring (6" or less) . . . . .	8d common	2 each direct joist
1" sub-flooring (8" or more) . . . . .	8d common	3 each direct joist
2" sub-flooring . . . . .	16d common	2 each direct joist
1" wall sheathing (8" or less in width) . . . .	8d common	2 each direct stud
1" wall sheathing (over 8" in width) . . . . .	8d common	3 each direct stud
Plywood roof and wall sheathing (1/2" or less) . . . . .	6d common	6" o.c. direct edges and 12" o.c. intermediate
(3/8" or greater) . . . . .	8d common	6" o.c. direct edges and 12" o.c. intermediate
(5/16", 3/8", or 1/2") . . . . .	16 ga. galvanized wire staples, 3/8" minimum crown; length of 1" plus plywood thickness	4" o.c. edges and 8" o.c. intermediate
(5/8") . . . . .	Same as immediately above	2 1/2" o.c. edges and 5" o.c. intermediate
Plywood subflooring:		
(1/2") . . . . .	6d common <i>or</i> 6d annular <i>or</i> spiral thread	6" o.c. direct edges and 10" o.c. intermediate
(5/8", 3/4") . . . . .	8d common <i>or</i> 6d annular <i>or</i> spiral thread	6" o.c. direct edges and 10" o.c. intermediate
(1", 1 1/8") . . . . .	10d common <i>or</i> 8d ring shank <i>or</i> 8d annular <i>or</i> spiral thread	6" o.c. direct edges and 6" o.c. intermediate
(1 1/2") . . . . .	16 ga. galvanized wire staples	4" o.c. edges and 7" o.c. intermediate
(5/8") . . . . .	3/8" minimum crown, 1 1/8" length	2 1/2" o.c. edges and 4" o.c. intermediate
Built up girders and beams . . . . .	20d common	32" o.c. direct
Continuous header to stud . . . . .	8d common	4 toenail
Continuous header, two pieces . . . . .	16d common	16" o.c. direct

Building element	Nail size and type	Number and location
$\frac{1}{2}$ " fiberboard sheathing	$1\frac{1}{2}$ " galvanized roofing nail <i>or</i> 6d common nail <i>or</i> 16 gage staple, $1\frac{1}{8}$ " long with minimum crown of $\frac{7}{16}$ "	3" o.c. exterior edge, 6" o.c. intermediate
$\frac{25}{32}$ " fiberboard sheathing	$1\frac{3}{4}$ " galvanized roofing nail <i>or</i> 8d common nail <i>or</i> 16 gage staple, $1\frac{1}{2}$ " long with minimum crown of $\frac{7}{16}$ "	3" o.c. exterior edge, 6" o.c. intermediate
Gypsum sheathing	12 gage $1\frac{1}{4}$ " large head corrosion-resistive	4" o.c. on edge, 8" o.c. intermediate
Particleboard ( $\frac{3}{8}$ " - $\frac{1}{2}$ " )	6d common	6" o.c. direct edges and 8" o.c. intermediate
( $\frac{5}{8}$ " - $\frac{3}{4}$ " )	8d common	6" o.c. direct edges and 8" o.c. intermediate
Particleboard sheathing		
( $\frac{3}{8}$ " - $\frac{1}{2}$ " )	6d common	6" o.c. direct edges and 12" o.c. intermediate
( $\frac{5}{8}$ " - $\frac{3}{4}$ " )	8d common	6" o.c. direct edges and 12" o.c. intermediate
Shingles, wood*	No. 14 B&S corrosion-resistive	2 each bearing
Weather boarding	8d corrosion-resistive	2 each bearing

\*Shingle nails shall penetrate not less than  $\frac{1}{4}$  inch into nailing strips, sheathing or supporting construction except as otherwise provided in Section 854.4.4.

**Table M-1**  
**MAXIMUM SPACING OF GYPSUM WALLBOARD FASTENERS**  
 (For non-fire rated construction assemblies)<sup>5</sup>

Thickness of gypsum wallboard (inch)	Plane of framing surface	Long dimension of gypsum wallboard sheets in relation to direction of framing members	Maximum spacing of framing members (center-to-center) (in inches)	Maximum spacing of fasteners (center-to-center) (in inches)		Nails <sup>1</sup> to wood <sup>4</sup>
				Nails <sup>12</sup>	Screws <sup>3</sup>	
1/2	Horizontal	Either direction	16		12	No. 13 gauge, 1-3/8" long, 19/64" head No. .098 gauge, 1-1/4" long, Annular ringed 5d, cooler nail
	Horizontal	Perpendicular	24	7	12	
	Vertical		24	8	12	
5/8	Horizontal	Either direction	16	7	12	No. 13 gauge, 1-5/8" long, 19/64" head No. .098 gauge, 1-3/8" long, Annular ringed 6d, cooler nail
	Horizontal	Perpendicular	24	7	12	
	Vertical	Either direction	24		12	
Fastening required with adhesive application						
1/2 or 5/8	Horizontal	Either direction	16	16	16	As required for 1/2" and 5/8" gypsum wallboard, see above
		Perpendicular	24	12	16	
	Vertical	Either direction	24	24	24	
2-3/8 (3/4 total)	Horizontal	Perpendicular	24	16	16	Base ply nailed as required for 1/2" gypsum wallboard and face ply placed with adhesive
	Vertical	Either direction	24	24	24	

**Note 1.** Where the metal framing has a clinching design formed to receive the nails by two edges of metal, the nails shall be not less than 5/8 inch longer than the wallboard thickness, and shall have ringed shanks. Where the metal framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d cooler nail (No. 13 1/2 gauge, 1 5/8 inches long, 15/64-inch head) for 1/2 inch gypsum wallboard; 6d cooler nail (No. 13 gauge, 1 3/4 inches long, 15/64-inch head) for 5/8 inch gypsum wallboard.

**Note 2.** Two nails spaced not less than 2 inches apart, nor more than 2 1/2 inches apart and pairs of nails spaced not more than 12 inches center-to-center may be used.

**Note 3.** Screws shall be No. 6 with tapered head and long enough to penetrate into wood framing not less than 5/8 inch and metal framing not less than 1/4 inch.

**Note 4.** All nails shall meet ASTM C514 or Federal Specification FF-N-105C.

**Note 5.** For fire-resistance rated construction see the pertinent fire test information.



# APPENDIX N

## METRIC EQUIVALENTS

1 inch equals 25.4 millimeters	1 horsepower equals 0.746 kilowatts
1 inch equals 2.54 centimeters	1 millimeter equals 0.039 inch
1 foot equals 0.305 meter or 30.48 centimeters	1 centimeter equals 0.394 inch
1 yard equals 0.914 meter	1 meter equals 3.281 feet
1 mile equals 1.609 kilometers	1 meter equals 100 centimeters or 1000 millimeters
1 square inch equals 6.452 square centimeters	1 kilometer equals 0.621 mile
1 square foot equals 0.093 square meter	1 kilometer equals 1000 meters
1 square yard equals 0.836 square meter	1 square centimeter equals 0.155 square inch
1 acre equals 0.405 hectare	1 square meter equals 10.764 square feet
1 cubic inch equals 16.387 cubic centimeters	1 hectare equals 2.471 acres
1 cubic foot equals 0.028 cubic meter	1 cubic centimeter equals 0.061 cubic inch
1 cubic yard equals 0.765 cubic meter	1 cubic meter equals 35.315 cubic feet
1 quart (liquid) equals 0.946 liter	1 cubic meter equals 1.308 cubic yards
1 gallon equals 0.004 cubic meter	1 liter equals 1.057 quarts (lq.)
1 ounce (avoirdupois) equals 28.349 grams	1 gram equals 0.035 ounces (avdp.)
1 pound (avdp.) equals 0.454 kilogram	1 kilogram equals 2.205 pounds (avdp.)
1 ton (2000 pounds) equals 0.9072 metric ton or 907.2 kilograms	1 metric ton equals 1.102 tons or 2204.6 pounds (avdp.)
	1 metric ton equals 1000 kilograms
	1 kilowatt equals 1.134 horsepower



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